The Chemical Age

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NOTICES :—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Twenty-five Years of Progress

DR. E. F. ARMSTRONG'S address at the Chemical Industry Club on Monday evening on the progress of chemistry in the last twenty-five years was one which might have been listened to with profit by all interested in the profession and industry of chemistry. Almost in every sentence it reflected unconsciously the vital relation between chemistry and national life. In that respect it differed from most of our learned discourses which unfortunately are addressed too often solely to chemists, and being in addition expressed in a vocabulary the meaning of which is also confined to the laboratory, are apt to leave the public quite untouched. Chemistry, vital as it is to almost every other interest in the country, has suffered in public repute and recognition from the want of exponents who could interpret its work to the public in the ordinary terms of public life. We have, perhaps, a handful of leaders who are capable of discussing chemistry in commercial language, and to these Dr. Armstrong must certainly now be added, if he is not already included. Arriving from Germany only a few hours before the meeting, he read no formal paper, but, delivered in a pleasantly intimate and conversational style, his address contained a volume of sound commercial statesmanship such as is rarely compressed into forty minutes. In the office, which he is shortly to take up, of president of the Society of Chemical Industry he might do a really great work by expounding such views in all quarters of the country. It is desirable that not only chemists but the public generally should be educated in these larger commercial aspects of chemistry that it would be criminal to attempt the restriction of such knowledge to the esoteric community who compose this or that particular society.

Starting properly with education, Dr. Armstrong sees a welcome contrast between the indifferent provision for chemical training which existed twenty-five years ago and the ample facilities enjoyed to-day. No longer is it essential that a student should go to Germany to qualify as a chemist; at the same time Dr. Armstrong advises any young chemist who aims at going far in his career to obtain as wide an experience as possible, and not to neglect the Middle-West of America any more than Europe in his search for it. Similarly while he pleads for the highest standard of technical and academic qualification—seeming to favour the ultimate ideal of a close profession like medicine and law—he emphasises the importance of the chemist being also a man of the world. In the great German concerns technical men are always to be found among the real commercial leaders of the concern, while here the chemist is too often an obscure worker in his own corner, whose knowledge has to be turned to commercial account by others. The remedy for this isolation is that the chemist should be taught to cultivate a broad public outlook, should travel widely, and should become, in short, a man of the world as well as a man of science. Dr. Armstrong is very far from despondent, especially with regard to heavy chemicals, but he feels the need of greater unity between the various societies and closer co-operation between all interests on behalf of the industry as a whole, and among our most imperative needs he places the thorough reorganisation of our whole system of transport.

"Wild-Catting"

THERE must be quite a number of individuals who have lived to regret the enthusiasm which prompted them to place their faith (and capital) in oil-development propositions. On the other hand, there must be many who have good cause to congratulate themselves on the wisdom of their selection of oil investments, for this industry is one in which luck has been the

predominant factor, and in some instances exceptional prosperity can be pointed to. It would appear, however, that science is shortly going to make the path of the pure speculator who appeals for public money in high-sounding phraseology a trifle more difficult than has up to now been the case; for by a systematic analysis it would now seem possible to form a fairly accurate indication of the prospects of success before the expenditure of much money is called for.

In the brief survey of the technology of petroleum which has recently been issued by the Institution of Petroleum Technologists there is a most engaging contribution by Mr. E. H. Cunningham Craig, dealing with what in oil parlance is known as "wild-catting." Although every article in this survey is well worth close study, we single out this one in particular for the reason that the writer has interwoven some exceptionally interesting facts with a certain amount of dry humour, which is a welcome novelty in technical transactions. Moreover, though only a small proportion of our readers may be interested in the more involved technique of oil-production, there are probably few of them who are not, or who have not been, interested as investors. In America, apparently, every first well in a new field (or a supposititious new field) is called a "wild-cat," quite irrespective of how scientifically it has been located or selected. In this country the term is of less honourable application. It stands, in fact, for speculation without knowledge. For all that, it is most necessary to wrestle with the problem which the word involves, if only for the sake of the light which may be thrown on petroleum ventures generally.

As yet the impression prevails that petroleum is an elusive and uncertain mineral, and that success is largely a matter of chance. Mr. Cunningham Craig tells us, however, that this idea is gradually dying out; and once it is possible to provide a favourable answer to questions embodied in a formal catechism, the striking of oil at the selected spot becomes something approaching a certainty. It is seldom, however, that every question can be answered before drilling is begun; some one factor remains uncertain, and consequently the element of speculation still remains. On this basis we arrive at a partial "wild-cat," and the proposition is gauged by the number of its undetermined factors. The progress of science is playing its part in that as knowledge spreads it is becoming increasingly less difficult to provide answers to the preliminary questions before actual drilling starts. Whereas in the past the prospector was equipped with hope rather than knowledge, to-day the geologist can enter the field and, at least, estimate the chances of a well on a percentage basis, setting known against unknown factors, and largely reducing the risk. We are told, in fact, that there are cases, even in a new field, where the speculative element may be reduced practically to vanishing point; but such cases are admittedly few. The whole matter is, however, of very considerable significance, and prospective investors may be recommended to assimilate Mr. Cunningham Craig's facts before committing themselves too heavily. The advice is, perhaps, the more necessary in view of the large amount of capital that now appears to be free for investment and the eagerness of its owners, stimulated by the recent advances in capital value, to secure a high return on it.

Explosibility of Ammonium Compounds

A DISTINGUISHED chemist just returned from Germany brings some interesting news bearing on the recent Oppau explosion. The explosion, it will be remembered, took place at the great works for the production of synthetic ammonia by the Haber process, and though it resulted in considerable loss of life and in the destruction of the colony of workmen's dwellings the actual works suffered much less than might have been expected. No satisfactory explanation has yet been furnished of the cause of the explosion, but naturally the German chemists have been at work on the compounds of ammonium nitrate and ammonium sulphate which had been handled and stored in the confident belief that there was no danger of detonation. It is now stated that the chemists who have been conducting these experiments have failed to detonate these compounds, and that, so complete is the faith of the management in their chemists' advice, that they propose to go on producing them as if nothing untoward had ever happened. That is one side of the story. The other is that while these laboratory experiments in the detonation of compounds of synthetic ammonium salts may be most satisfactory, cases have been known where, in large scale practice, great care had to be taken to avoid detonation. One gets so many accounts of wonderful things happening in Germany that a little reserve in accepting them is sometimes desirable, but we give this story of the policy of the Oppau management very much as it reaches us.

From the United States, however, comes an official announcement that on the recommendation of the Committee of the National Research Council on the Investigation of the Explosibility of Ammonium Compounds the U.S. Bureau of Mines will undertake an investigation into the explosibility of synthetic ammonium nitrate under pressure on small scale. The work of the committee has for its general purpose the investigation of the explosibility of ammonium compounds, but the Bureau of Mines work, as now proposed, is limited "(*a*) to small scale tests with charges not to exceed 10 lb.; (*b*) to that particular ammonium compound designated ammonium nitrate; (*c*) to that particular ammonium nitrate which is customarily transported and stored as such outside of powder factories; that is to say, imported synthetic ammonium nitrate." This new investigation is to be conducted on samples at normal temperature, at normal density, and at a definite but as yet unstated confinement, and the criterion of explosibility is to be the compression of small lead blocks. The work will be under the direction of Mr. S. P. Howell, explosives engineer at the Pittsburgh, Pa., experiment station.

Tar and Its Derivatives

TECHNICAL PAPER 268, by Mr. W. W. Odell, fuel engineer, just issued by the U.S.A. Bureau of Mines, deals with "The preparation and uses of tar and its simple crude derivatives." The importance of tar as a commercial product, it is pointed out, has been emphasised during the past five or six years more than ever before. In that time, the market for tar and its products fluctuated in an unprecedented way, because of the war and other conditions, with the result that the production of tar and tar products

increased greatly. A large proportion of the increase is due to the installation of by-product coke ovens, which are fast replacing the beehive ovens, from which tar and other by-products are not recovered. The increasing demand for steel and the shortage of anthracite coal during the war were a great impetus to the United States coking industry. In 1920 tar was being produced in greater quantities than ever before, but the entire output was not on the market for sale, as increasingly large quantities were being used for fuel. However, in some localities where the output of tar was small or was of inferior quality—particularly water-gas tar—there seemed to be no great demand for the product.

Mr. Odell, in his paper, discusses the uses to which some of the various tars are put, and shows briefly the usual methods of working up tar into some of its simple or easily-prepared derivatives, for which a market can generally be found. Although coal tars are given chief consideration, the properties and characteristics of water-gas tar are mentioned, for the reason that this tar is often produced in plants where coal tar is made, the mixed tar being collected and marketed, and for the further reason that the presence of water-gas tar in some coal-tar products is specifically interdicted by commercial specifications. This publication is not a handbook on tar distillation, for that subject can hardly be covered adequately in such limited space, but is issued as a general treatise on the utilisation of tar. It is one of a multitude of technical publications, in which many of our readers from time to time have expressed a keen interest, and copies may be obtained on application to the Bureau of Mines, Washington, D.C., by mentioning THE CHEMICAL AGE, and quoting the number of the publication.

A Proposed Entrance Fee

THE committee of the Chemical Industry Club have decided on a step often suggested but hitherto deferred for various reasons. This is to recommend the imposition of an entrance fee of two guineas from January of next year. Considering the advantages the club offers for the modest membership fee of three guineas, the proposed entrance fee cannot be regarded as exorbitant, and it is hoped that it will have the effect of stabilising the membership. The inflow of new members is fairly constant, but the advantage is partly lost through the lapse of a certain percentage annually, and it is thought that the latter tendency may be checked by the introduction of an entrance fee. In addition, it would bring the policy of the club into line with that of similar institutions, and would still leave the club one of the most reasonable in point of charges to be found in the West of London. It may now be taken as firmly established as a part of the organisation of chemical industry, and of late it has been extending its field of service. The experiment of arranging for discussions and addresses on subjects which scarcely fall within the scope of the strictly scientific societies but are nevertheless of great interest to the industry and profession has thoroughly justified itself, and gradually this sort of activity may spread further still. The proposal to fix the entrance fee at two guineas is to come up for discussion at the next annual meeting, and it is to be hoped that the members will support the committee in their action.

Points from Our News Pages

Mr. G. F. Zimmer contributes an article in which he describes a modern installation for the mechanical handling of superphosphate (p. 618).

In an article on "The Manufacture of Fertilisers," Mr. L. Carpenter pays particular attention to caking and mixing problems (p. 620).

At a meeting of the Manchester Section of the Society of Chemical Industry Mr. R. A. Bellwood gave an historical review of vegetable oil extraction processes (p. 622).

Details concerning the production of titanium oxide and its uses as a paint material were given by Mr. Noel Heaton at a meeting of the Royal Society of Arts (p. 624).

Trade, according to our London Market Report, is on the whole better, and greater confidence is being shown by consumers. (p. 637)

Our report of the Scottish Chemical Market states that inquiries, especially for export, have been more numerous but that only a slight improvement is visible in the actual amount of business. (p. 639).

Books Received

DICTIONNAIRE ANGLAIS-FRANCAIS-ALLEMAND DE MOTS ET LOCUTIONS INTÉRESSANT LA PHYSIQUE ET LA CHIMIE. By R. Cornubert. Paris: Dunod, Editeur. Pp. 297. 42 fr.

THE PETROLEUM INDUSTRY. Edited by A. E. Dunstan. London: The Institution of Petroleum Engineers. Pp. 346. 14s. 6d. net.

PRACTICAL PLANT BIOLOGY. By H. H. Dixon. London: Longmans, Green, & Co. Pp. 291. 6s. net.

NON-BENZOID HYDROCARBONS. By B. T. Brooks. New York: The Chemical Catalog Co. (Inc.). Pp. 617. $7.

DIETARY STUDY OF SOME KANSAS INSTITUTIONS. By E. H. S. Bailey. Kansas State Printing Plant. B. P. Walker. Pp. 70.

ANNUAL REPORTS OF THE PROGRESS OF APPLIED CHEMISTRY. London: The Society of Chemical Industry. Pp. 625. 12s. 6d. (members), 7s. 6d. (non-members).

FLUIDITY AND PLASTICITY. By E. C. Bingham. London: The McGraw-Hill Publishing Co., Ltd. Pp. 440. 20s.

SOME PHYSICO-CHEMICAL THEMES. By A. W. Stewart, D.Sc. London: Longmans, Green, & Co. Pp. 418. 21s.

The Calendar

May		
15	Safeguarding of Industries Act. Committee under Part II. Inquiry into the sale of optical and other scientific instruments. 3 p.m.	Hotel Windsor, Mines Department, Victoria Street, London.
15	Safeguarding of Industries Act. Committee under Part II. Inquiry into the sale of glass bottles. 2.30 p.m.	5, Old Palace Yard, Westminster, London.
16	Royal Institution: Tyndall Lectures, "Tyndall's Biological Researches" and "The Foundations of Bacteriology." Professor W. Bulloch.	21, Albemarle Street, London.
16	Royal Photographic Society: "Natural Colour Photography." J. F. Shepherd. 7 p.m.	Royal Photographic Society, 35, Russell Square, W.C. 1.
17	Society of Glass Technology: Meeting. 2.30 p.m.	The University, Sheffield.
18	University of London: "Atoms, Molecules, and Chemistry." Sir J. J. Thomson. 5.15 p.m.	University College, Gower Street, London.
18	Chemical Society: Ordinary scientific meeting and informal meeting.	Burlington House, Piccadilly, London.
18	Royal Institution: "Plant Sensitiveness to Contact and Chemical Stimulation." F. Keeble.	21, Albemarle Street, London.
19	Royal Institution: "The Structure of Organic Crystals." Sir W. Bragge.	21, Albemarle Street, London.

The Mechanical Handling of Super-Phosphate

By George Frederick Zimmer, A.M.Inst.C.E.

The author, who is well-known as an authority on this subject, describes an installation for the mechanical handling of super-phosphate, by means of which manual labour is almost entirely dispensed with.

SUPER-PHOSPHATE is one of the most difficult substances to deal with mechanically, though one might think by the appearance and feel of the material that it would be an easy matter to handle it. When agitated—and a certain amount of agitation is unavoidable—it has a tendency to change to a sloppy consistency and may adhere to such an extent to handling machinery that the labour involved in cleaning off such deposits renders the apparent economy illusory. On this account super-phosphate has in the past generally been handled by manual labour. When attempts have been made to employ the machines they have generally been but a partial success.

In this article an account is given of an installation designed and built by S. S. Stott & Co., of Haslingden, with the object of eliminating manual labour as far as possible.

As should be well known, super-phosphate is manufactured in the following way:—The ground phosphate rock and a certain amount of sulphuric acid are passed through a mixing machine which stands on a floor above the dens or cellars in which it must lie for some time to mature. After this mixing, the substance is allowed to run by gravity into one of the dens. Large wooden doors are provided for these dens which are placed in position before they are filled, and when one of the dens is ready for discharging the door is lifted away bodily, in modern plant, by a small overhead crane. Previous to the adoption of the mechanical handling devices which form the subject of this essay, the super-phosphate had to be cut from the pile in the dens by a gang of men with spades, shovels, and wheel-barrows.

The mechanical excavator consists essentially of a carriage with flanged wheels which travels on a steel rail-track reaching from end to end of a series of two, three, or more dens. Superimposed upon this is a mild steel structure on a turntable. The excavator-arm is located in such a way in a central position of the steel structure that it may be raised or lowered relative thereto as well as rotated therewith. With this provision the arm which carried the moving scrapers can be swung into the requisite position, and made to enter any one of the dens (in this case only two). In Fig. 1 the steel structure will be seen together with the scraper arm extended in front of the dens. The carriage and its track work in an excavated channel and are not, therefore, visible in this view. In Fig. 2 the same device is shown at work raking out the contents of one of the dens; from this illustration it will also be seen how the travelling backward and forward of the apparatus is effected by a drag-chain, the device being provided with grab-hooks which automatically engage with the chains for any backward or forward movement of the excavator.

The scraper-arm is driven by a 7 b.h.p. electro-motor, supported on the inner end of the arm, *i.e.*, within the steel structure, and the motor is raised or lowered vertically with the scraper-arm. The scraper proper is an endless running chain conveyor fitted alternately with stirrers and prongs. The cantilevered arm is suspended by a cast-iron yoke from steel wire ropes and counterbalanced by a weight seen in Figs. 1 and 2.

When a den is to be discharged the door is removed by a small overhead crane which may be seen in Fig. 2; the scraper-arm is then raised to its highest position, in which it is introduced into the den and started to work, cutting a slice of super-phosphate a few inches deep from the top of the bed; when the material is thus raked out it falls upon the tray-conveyor in front of the dens. When the excavator has travelled laterally across the top of the deposit reaching the other wall, an automatic gear lowers the scraper arm a few inches and simultaneously reverses the motion of the machine, thus commencing another cut of the bed on its return travel. This operation is repeated until the den is empty.

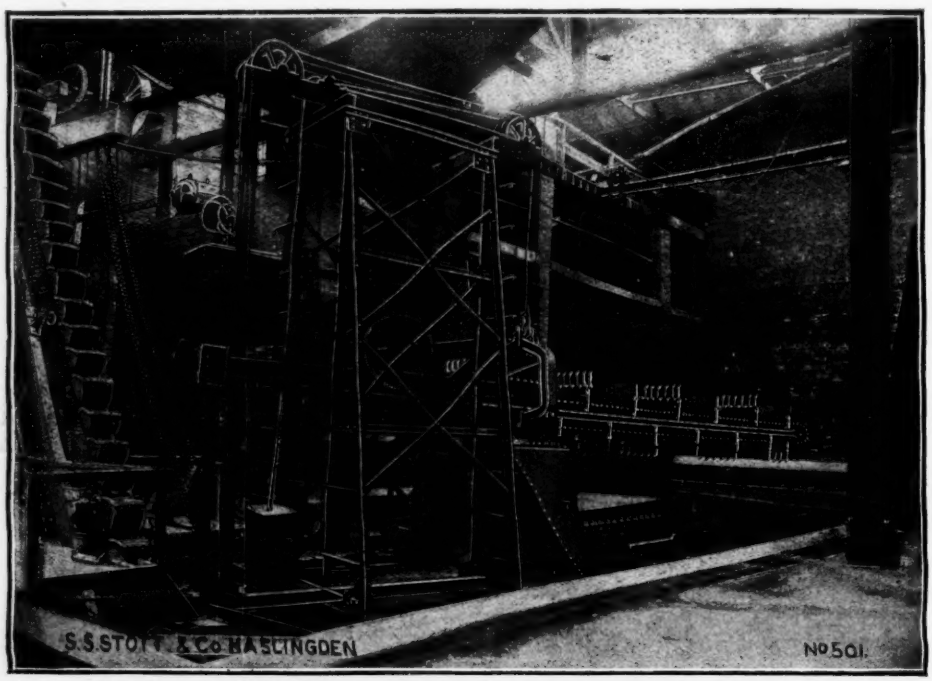

FIG. 1.—PHOTOGRAPHIC VIEW OF THE PHOSPHATE EXCAVATOR BEFORE THE SCRAPER-ARM IS SWUNG INTO THE DEN.

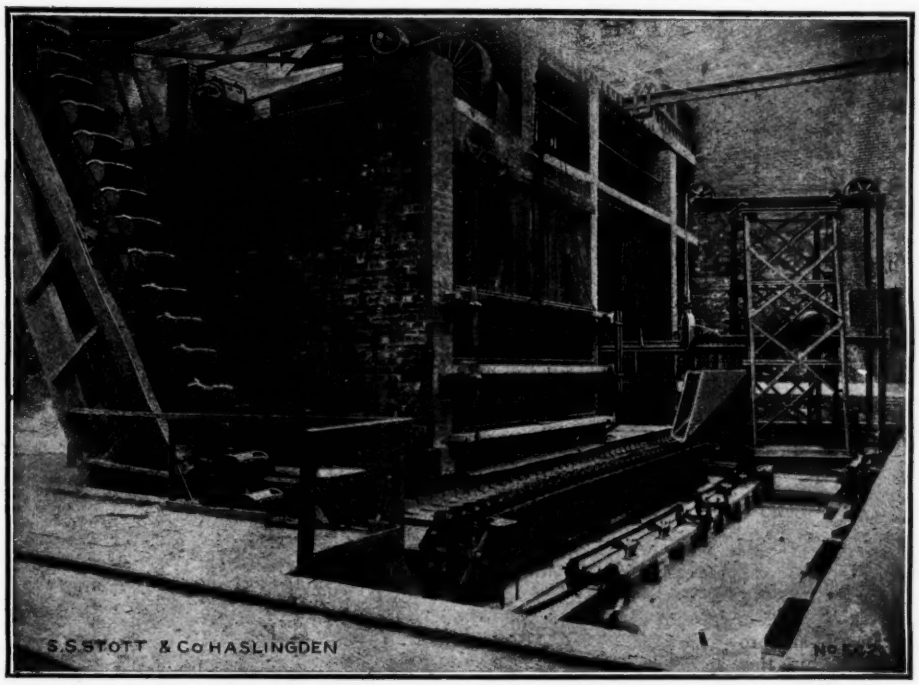

FIG. 2.—THE PHOSPHATE EXCAVATOR AT WORK WITHIN THE DEN, DELIVERING TO THE PAN CONVEYOR AND THENCE TO THE BUCKET ELEVATOR.

It will be noticed that during these reciprocating journeys from side to side of the den the excavator travels alternatively in the same and then in the reverse direction with the tray conveyor. When the former is the case the amount of super-phosphate deposited into each individual tray of the conveyor is much greater than when the excavator travels in the reverse direction of the conveyor. It was, therefore, necessary to construct the tray conveyor for a maximum capacity, and it is, therefore, 24 in. wide.

On reaching the end of the tray-conveyor the super-phosphate is delivered to the boot of an inclined bucket elevator, 37 ft. long from centre to centre, with malleable cast-iron buckets 18 in. wide, by which it is lifted and delivered into tip wagons on the floor above the dens for conveyance on an overhead track to an adjoining shed to be stored. In Fig. 3, the delivery terminal of the pan conveyor as well as the bucket elevator will be seen.

The conveyor is 41 ft. 6 in. long from centre to centre, and 24 in. wide; it is carried on a single strand of No. 600 Ley's bushed chain, each tray having a mild steel axle with two cast-iron trod-wheels. The inclined elevator carries buckets at a pitch of 18 in. which are attached to a double strand of the same chain as the conveyor.

The electro-motor seen in the upper portion of Fig. 1 is one of 30 h.p., and drives the mixer, the drag-chain for travelling the excavator, as well as providing power for the tray-conveyor and bucket elevator; these same devices are also seen in Fig. 3.

The two dens are 16 ft. wide each, they have a depth of 17 ft. from the open front to the back wall and are 18 ft. high from floor to ceiling. Their capacity is 50 tons each, which quantity can be removed by the plant in two hours. A very considerable saving of onerous labour is, therefore, effected by this installation, as almost the entire manual labour is deleted, with the exception of attendance.

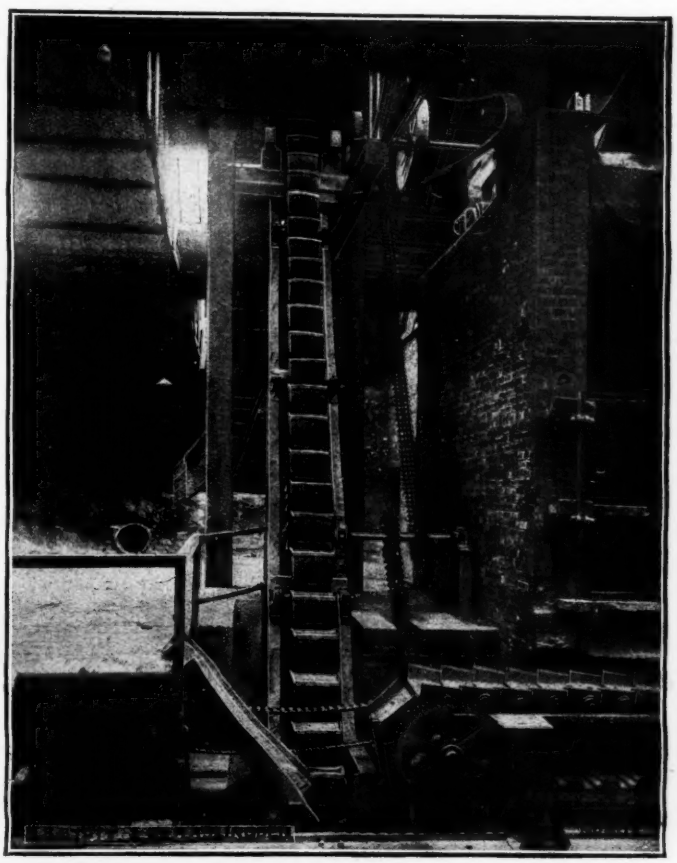

FIG. 3.—VIEW SHOWING THE POINT OF TRANSFER BETWEEN THE PAN CONVEYOR AND BUCKET ELEVATOR.

The Manufacture of Fertilisers

By L. Carpenter, B.Sc., A.I.C.

THE importance of an adequate supply of fertilising materials was never greater than at the present time, when the demands of an ever-increasing population for food have to be met. Moreover, no practical agriculturist to-day attempts to dispense with these important materials. The industry is now nearly a century old, yet, up to the present, comparatively few books have been written dealing with the subject from a manufacturer's standpoint.

All chemists are familiar with the process of rendering raw phosphate soluble by means of sulphuric acid according to the equation :

1. $Ca_3(PO_4)_2 + 2H_2SO_4 + 5H_2O = CaH_4(PO_4)_2H_2O + 2(CaSO_4 2H_2O)$.

This reaction actually takes place in two stages. In the first stage, two-thirds of the tri-calcium phosphate is converted into phosphoric acid, H_3PO_4, thus :

2. $2Ca_3(PO_4)_2 + 6H_2SO_4 = 4H_3PO_4 + 6CaSO_4$.

In the second stage this free phosphoric acid combines with the remaining one-third of the tri-calcium phosphate to form soluble mono-calcium phosphate, thus :

3. $Ca_3(PO_4)_2 + 4H_3PO_4 = 3CaH_4(PO_4)_2$.

For the sake of clearness the water has been omitted in these reactions. Reaction (2) takes place rapidly with evolution of heat, and is practically complete by the time the den is opened ; (3) completes itself slowly in the heap. This is one reason for allowing the heaps to stand about a week before bagging ; the other reason is to allow the $CaSO_4$ and $CaH_4(PO_4)_2$, particularly the former, to become fully hydrated. If bagged too soon the superphosphate sets in the bag, with the result that the buyer complains that he cannot use it.

In this country superphosphate is sold on a basis of water soluble phosphate, but in America, citrate soluble, *i.e.*, percentage soluble in ammonium citrate solution, is taken as the basis. Now di-calcium phosphate, $Ca_2H_2(PO_4)_2$, although insoluble in water, is soluble in ammonium citrate, and the reactions of its formation in the mixer and den are as follows :

4. $Ca_3(PO_4)_2 + 3H_2SO_4 = 2H_3PO_4 + 3CaSO_4$.

5. $2Ca_3(PO_4)_2 + 2H_3PO_4 = 3Ca_2H_2(PO_4)_2$.

(Water omitted as before for the sake of clearness.)

It will be seen that only one-third of the tri-calcium phosphate has to be converted into phosphoric acid instead of two-thirds, and this entails the use of only half the amount of sulphuric acid. The American manufacturer, therefore, not only saves half the amount of acid that the British manufacturer uses, but also obtains a much dryer product, which comes into condition sooner. His product would, however, take longer to become effective in the soil, as it would require to be dissolved by the soil acids.

Caking of Fertilisers

The question of the conditioning of fertilisers of all kinds is one which requires the closest attention of the manufacturer. Particularly in the case of compound fertilisers containing sulphate of ammonia is this evident ; for such, if bagged too soon, set to a hard, rock-like mass which requires to be pulverised before it can be used. The cause of this can be attributed to reaction between the ammonium salt and the phosphate.

6. $CaH_4(PO_4)_2 + (NH_4)_2SO_4 = 2(NH_4)H_2PO_4 + CaSO_4$.

The calcium sulphate takes up water in the usual way and sets to a hard mass which cements the whole together.

The more ammonium salts a compound contains up to a point, the greater is this tendency to set hard, and the more important is it for the manufacturer to be sure his product is not too new before bagging. Compounds containing 9 to 10 per cent. NH_3 require at least a month before they are in condition for bagging.

The fertiliser manufacturer executes the bulk of his home orders during the first six months of the year, from January to June. The previous six months, therefore, he is making for stock, and his requirements must be carefully estimated. The wise manufacturer makes ample stock of compounds containing 9 to 10 per cent. NH_3, about the highest grade among the commoner types of ammoniacal fertilisers. He can always break this down to compounds containing less NH_3 if necessary ; and by making the higher grade fertiliser early he ensures it being in condition. Should he, however, exhaust his stock of the higher grade material, and be compelled to send out his compounds before they have had ample time to come into condition, the evil effect may be diminished in several ways. One of these consists in adding a double allowance of drier such as raw (low grade) phosphate, sand, bone meal, &c., at the screening machine just before bagging. A certain proportion of drier must be incorporated in all compounds, and in this case a double allowance is given, which diminishes the tendency to set in the bags. Raw phosphate, however, increases the tendency of the soluble phosphate to revert to the insoluble or, rather, citrate soluble form, thus :

7. $CaH_4(PO_4)_2 + Ca_3(PO_4)_2 = 2Ca_2H_2(PO_4)_2$.

This is particularly the case with a product such as pure dissolved bones (known as " Pures "), which is sold under a guarantee of 16 per cent. soluble $Ca_3(PO_4)_2$ and 16 per cent. insoluble $Ca_3(PO_4)_2$.

In the conditioning of a fertiliser such as Dissolved Bone Compound (known as D.B.C.), which, by the way, contains no bone, a further point is introduced. D.B.C. is made by dissolving a mixture of raw phosphate and shoddy (wool waste) with sulphuric acid. The solution and decomposition of the shoddy takes place mainly in the heap, and is a slow process requiring about six months.

Calcium cyanamide is sometimes incorporated in compounds to prevent setting in the bags, but in quantities of over ½ cwt. per ton it causes appreciable reversion. It may also be incorporated at the dissolving loft, but the workmen object to it on account of its dusty nature and the strong smell of acetylene formed from traces of calcium carbide present. The sulphuric acid converts it into urea, which is a valuable fertiliser.

8. $CaCN_2 + H_2SO_4 + H_2O = CaSO_4 + CO(NH_2)_2$

Much heat is evolved in the mixer when adding cyanamide, and the superphosphate in the den assumes a bluish colour, and is quite hard and porous, resembling pumice.

Mechanical Mixers

Turning now to the mechanical side of fertiliser manufacture, it is interesting to note the great strides which have been made of recent years in the perfection of labour-saving machinery. In the old days the raw materials were laboriously carried to the mixer ; in fact, in the very earliest days of the industry they were mixed by hand, using long poles. Now the raw phosphate is brought by means of screw or belt conveyors, and deposited into a box on a weighing machine operated by an attendant, who shuts off the flow and empties the box, when the correct quantity has been weighed, into the mixer with the correct quantity of acid. Sometimes, even the weighing and measuring is carried out automatically, as in the Sturtevant apparatus. Or a continuous dissolving device may be used. In this the acid is measured continuously through a liquormeter, and the phosphate is also measured through a measuring machine of the table or other type. As far as the writer knows, however, this arrangement has not been used in this country on a manufacturing scale.

Mechanical excavators for superphosphate dens are now widely used, although hand excavation is still retained for such compounds as D.B.C. and Pures, which do not lend themselves to mechanical handling well. The Wenk den is made in the form of a tunnel 25 ft. long and 10 to 12 ft. in diameter ; a rotary cutter is caused to revolve and shave off the superphosphate, at the same time slowly travelling forward into the den to keep the cutting knives up to the face of the superphosphate, which falls on to a belt conveyor made of woven wire which travels along below the den. In another form of den the cutter is stationary and the cylindrical den moves forward by means of traversing gear, the superphosphate falling on to a belt conveyor placed below. In the Sturtevant den the excavators revolve on a vertical shaft, the den being rectangular in form. The peculiarity of this arrangement is that the superphosphate is excavated more or less in the open, thus getting ample opportunity to become dried during the process of emptying.

Effect of Mechanical Handling

The value of efficient handling plant is very evident in a fertiliser works, where very large quantities of materials have to be conveyed from one part of the building to another. A word may be said of portable belt conveyors; these may be employed to advantage in the raw phosphate store for bringing the phosphate up to the mills. They may also be used at the screening machines. The lower, feeding end of the conveyor may be placed under the outlet of the screening machine, and the product delivered over the upper end on to the floor to form a heap. The conveyor may be swung round in a circle having the lower end as centre, and heaps of different manures deposited around. By this means much labour can be saved. A word may be said as to the effect upon the products of mechanical handling. Superphosphate is in best condition when subjected to as little mechanical handling as possible, particularly to handling which tends to rub or grind the material; this causes it to become pasty and on drying it sets to small hard balls which are extremely difficult to disintegrate. Particularly is this so with superphosphate, in which sulphate of lime has been incorporated as a filler, and when making a low grade of superphosphate (containing 28 to 30 per cent. soluble phosphate), it is preferable to make it from a low grade raw phosphate, such as an Algerian phosphate, rather than to start with a high grade raw material and break it down with sulphate of lime.

Reviews

THE ENGINEERS' YEAR-BOOK FOR 1922. By H. R. KEMPE, assisted by numerous contributors. London: Crosby Lockwood & Son. Pp. 2,698. 30s.

The publication of Mr. Kempe's mammoth reference book is one of those annual events which every engineer anticipates with eagerness. Although Mr. Kempe has brought out his volume for twenty-nine consecutive years he always manages to make it progressively interesting and useful, and the chief hardship about purchasing each new edition as it makes its appearance is that one positively shrinks from discarding its immediate predecessors. It is not meant to suggest that the Year-book might be made of the quinquennial rather than the annual variety; for, although there are certain obvious data (*e.g.*, logarithms and trigonometrical tables) which can never suffer through the lapse of time, changes occur so rapidly nowadays that some facts are liable to be out of date before they are published. It has been suggested, in fact, that at the present rate of development the really enterprising text-book author will have to arrange for the inclusion of a "stop-press" column. However, in the art of keeping abreast of the times Mr. Kempe would appear to require no coaching, and the fact that every year each of the forty odd distinct sections is submitted to the individual contributors for thorough revision should speak for itself.

The chemist, and more particularly the chemical engineer, should not be misled by the title, for many of the sections deal with processes and information which concern chemical rather than engineering operations. Apart from useful memoranda which all connected with technical work must require at some time or other, there are complete sections which will directly appeal to the chemist—*e.g.*, Flour, Cotton, Oil, and Sugar Mills (by E. R. and F. Turner), Refrigeration (F. Simpson), Metallurgy (O. N. Ellis), Explosives (W. R. Hodgkinson), Gas and Gasworks Practice (Alwyne Meade), Coal and Mining (Professor Henry Louis), Fuels (Harold Moore), and Cements, &c. (A. B. Searle). Mr. Kempe started his handbook with 650 pages; to-day it has swollen to 2,700. M.

RESEARCH IN INDUSTRY. By A. P. M. FLEMING and J. G. PEARCE. London: Sir Isaac Pitman & Sons, Ltd. Pp. 244. 10s. 6d.

This interesting and comprehensive book, one of a series by the authors, examines both from the philosophical and material standpoints the history and development of Industrial Research, and emphasises its importance as a basis of economic progress. There is a useful chapter on the design and equipment of research buildings and examination of the relative advantage of co-operative and individual research, and an interesting comparative study of the different methods and characteristics of research workers in all parts of the world. In the last chapter the authors put in a strong plea for the encouragement by all nations of the tendency now beginning to show itself towards the internationalisation of research. The book is one that will be appreciated both by the student and the man of business; it has been prepared in the belief that not merely research itself, but the attitude of mind which favours experiment and the ascertainment of facts, cannot fail to benefit British industry.

IMPURITIES AND FALSIFICATIONS OF CHEMICALS, THEIR DETERMINATION AND RECOGNITION. By Dr. R. STRAUSS. Translated into English. Germany, Meissen: Bohlmann Verlag. Pp. 94.

This useful little book supplies a long-felt want. It has been written, as the author states in his preface, "for the manufacturer, the trader and consumer in the chemical industries, to acquaint him with the nature of the chemicals which pass through his hands, and to show him how to detect impurities and falsifications in them." There are countless books in the market on research methods, but these, although excellent for chemists, are often quite useless to the ordinary trader, owing to their highly technical nature. This selection of useful information and instructions for carrying out simple tests should fill the gap very satisfactorily.

TOWN GAS MANUFACTURE. By R. STALEY. London: Sir Isaac Pitman & Sons. Pp. 108. 2s. 6d.

Only recently Messrs. Pitman published a small volume the title of which was "Gas and Gasmaking," and which formed one of their "Common Commodities and Industries" series. This book was written by Mr. W. H. Y. Webber and gave a decidedly lucid *resumé* of the process of manufacturing towns' gas. It is, therefore, somewhat remarkable to find the same publishers issuing a second and very similar book dealing with the same subject, although Mr. Staley's book is a member of a different series, namely, the "Technical Primers." The author is, of course, writing for those who are entirely unversed in the procedure of making coal gas and water gas. His book is one which would make an admirable present for a very young student. C. A.

"The Coalescence of Solids"

To the Editor of THE CHEMICAL AGE

SIR,—In Mr. Pollitt's interesting article on "The Coalescence of Solids," in your issue of April 29, he makes the statement: "It seems reasonable to assume that zero fluidity is reached when the proportion of liquid to solid is . . . sufficient to fill the voids in the solid powder. Experiment lends support to this view."

In the laboratory that I am directing many determinations of the voids in sands have been made, and, in my view, Mr. Pollitt's statement can be made with much less caution and considerably greater emphasis. It is the common observation that the mixture of fluid and solid attains a maximum stability—or, conversely, a minimum fluidity—when the voids are just filled by the liquid; before this point is reached the sand moves about somewhat freely, and later the mixture is in the condition of an incipient quicksand.

The phenomenon is a somewhat complex one, involving size and shape of particles which determines the degree of contact between them and the size and number of voids, surface tension between liquid and solid, and viscosity of the liquid.—Yours, &c. PERCY E. SPIELMANN.

May 4, 1922.

Vegetable Oil Extraction

R. A. Bellwood's Review of Ancient and Modern Processes

THE eighth meeting of the Manchester Section of the Society of Chemical Industry was held on Friday, May 5, Dr. E. Ardern presiding.

MR. R. A. BELLWOOD, of Hull, read a paper on "The Progress of Vegetable Oil Extraction," which dealt entirely with the extraction of oils by pressing machinery. Mr. Bellwood said that although it was known from the Old Testament that the Israelites had knowledge of oils there was no reference to the appliances they used. It was, however, learned from the early writers that the winning of oils technically was known to the Egyptians, from whom the Israelities, in all probability, received their knowledge of the practice. It was believed that the Egyptians knew of the expressing of oils at least 5,000 years ago, and an illustration of a press for extracting juice from grapes was shown in Wilkinson's "Egypt." This press consisted of a strong wooden framework and a stout stuff bag, containing the material to be pressed, suspended horizontally between vertical posts, which were subjected to a wringing and squeezing pressure which brought out the liquid contents. In all probability the same kind of press was used for the expression of oils from olives. Vetrurius, in an article written two or three thousand years ago mentioned oil presses with very long levers. Pliny (23 A.D.) gave a description of an oil mill consisting of a set of stones for grinding olives, these stones being somewhat similar in appearance to those used at the present day. The stones were convex on the face instead of flat as now used. A centre shaft or axle passed through the centre of the stones, which were dragged round by slaves. The olive pulp was taken from the stones and put into sacks made of woven rushes, and then placed underneath very heavy flat stones, which were lifted by means of levers, so that the olives could be placed beneath to receive the pressure or taken away when the pressing process was complete.

"Pestle and Mortar"

The ancients, generally speaking, used what was usually known as the "pestle and mortar" press. Luke Herbert, a civil engineer, in an article published in the "Engineers' and Mechanics' Encyclopedia" in 1863, made the statement that he had been so forcibly impressed with the defects of the "pestle and mortar" press that he had designed a few years previously a more powerful machine, in which the combinations were few and of a simple character, and easily made by the rough workman at a trifling expense. He asked the reader of the encyclopædia to bear in mind that the press was designed for the expression of oil on the spot where the seeds grew. Several writers had wrongly attributed the invention of Luke Herbert's press to the ancients.

It was difficult to decide what form of press followed the ancient lever press, but in all probability it was a crude form of the "pestle and mortar" press. The mortar was built out of the trunk of a tree, with a lining usually made of boxwood. There was a long paw which was used as a pestle and this was given a rolling motion by means of a rope arrangement and bullock power. A modified form of the "pestle and mortar" apparatus was commonly in use in India and China, and Mr. Bellwood produced an actual cake made in one of them. A typical installation, shown upon the screen, was made pre-war for £20. This was an indication of the difficulty facing English engineers when competing with native labour.

The "Wedge" Press

In all probability the "wedge" press followed, or was contemporary, though its use, apparently, had now been discontinued. When using the "wedge" press, the seed was first ground under stones, and a form of stone which was used even to-day in some parts of China was exhibited upon the screen. There was only one stone, with a small diameter and very large face. The face was passed into a feeding box by means of a small slide. The power was supplied by bullocks or horses. The ground seed was taken away from the stone in a riddle closely resembling that used by housewives to-day for riddling cinders, and placed on the top of a copper similar to that used to-day for clothes-washing purposes. Steam was evolved from the copper, moistening and tempering the seeds, being practically the same process adopted in modern oil mills. After tempering, several measures of the meal were placed in a bag made of straw, the whole again being put in a container arranged below two heavy beams. Pressure was applied to the material by means of a long wedge arranged between the two beams, so as to force them apart. The wedge was driven in by means of a heavy hammer suspended from the ceiling. Near the bottom of the container there was a pipe arranged to carry away the oil.

Stamper Mills

Stamping mills were used in the 10th century for crushing oil seeds, and Zeisung described an oil mill of this type. The "sledgehammer" press was improved by the Dutch in the seventeenth century. They introduced a "stamper" press, which was not used for crushing the seed but which was actually a press. In the early Dutch mills the seed was crushed under upright revolving stones. It was heated in pans over an open fire, and the oil was then expressed by means of the stamper-wedge press. The Germans, as was their wont, claimed the credit of first producing the vertical type of stamper-wedge press, but there was no doubt that it was the Dutch who introduced it into England. These stamper mills were almost entirely built of wood, and the workmanship reflected great credit on the old millwrights. An illustration was shown of an early Dutch mill which was running about the year 1790. The power was supplied by a wooden waterwheel of about 18 ft. diameter and 4 ft. wide. A pair of cast-iron rollers crushed the seed before it went to the stone. The frame, driving shaft, wheels, and stamper were made of wood. Stamper mills driven by water power were installed at Liverpool in 1804. In 1858, Alexander Samuelson, of Hull, a manufacturer of oil machinery, gave a lecture before the Society of Mechanical Engineers, which was reported in Spon's dictionary, and described an old type of stamper press which was in use in this country until 1860.

Hydraulic Presses

It was believed that stamper mills were in existence in Hull at the end of the seventeenth century, and it was known that there were at least two of these mills at work in 1810. They were superseded by the hydraulic press, which was made possible by Bramah's invention of the "U" ram leather. This invention revolutionised the oil-milling industry. It was difficult to say with certainty when the first hydraulic press was made for use in oil mills, but it was generally believed that in England it was about 1814, in Germany about 1818, and in France about 1819. They were in use in Hull about 1830. A press was made by Mr. Bramah, and sent out by the British Government to Ceylon, for the purpose of expressing oil from coconuts. The hydraulic press did not gain the confidence of the public as quickly as it should have done. A number of other developments occurred, including the introduction of the steam-heated kettle. It was not definitely known when the idea of steam jacketing the kettle bottom was first mooted, but it was after the year 1787, because Smeeton then took out a patent for cooking kettles which he described as being heated by water or sand.

A Mr. Blundell, of the firm of Blundell, Spence, and Co., colour manufacturers, was credited with being responsible for the design of the "Four-box" hydraulic press, and he introduced it into his mill at Hull about 1830. Among the earlier manufacturers of this press were Whitman, of Leeds; Rose, Downs, Thompson & Co., of Hull, and Alexander Sanderson & Co., of Hull. It was first introduced in Liverpool about 1845. The style of hydraulic pumps used in those times was still in vogue. The diameter of the press ram was 12 inches, the stroke was about 10 inches, and the press was fitted with four boxes, and received four bags of seed, producing a weight of 64 lb. of meal, or cake, at each operation. Samuelson described the seed as being carried to the press in canvas or hair bags. In 1847, James Robson proposed the substitution for hair cloths of an instruments which was constructed of two metal perforated plates.

Smeeton improved the operation of roller mills by making the rolls of unequal diameters. Practically no variation had been made in the type of "edge runner" stones. W. E. Newton, in 1856, patented a device for the continuous feed of material to the stones, with an arrangement of sweepers whereby it was taken away gradually as it was ground, thus rendering the process quite automatic. This same principle was in use to-day in many of the larger oil mills in this country.

It had been generally understood that the idea of using a press with a number of supported plates, and a moulding machine to give the prepared meal a preliminary compression, dated from the year 1874. This was found to be so by

Mr. James Downs, of Hull, who, in 1784, patented a press for extracting oil from seeds which entirely superseded the "four-box" presses. It consisted of a series of wrought-iron plates, upon either side of which was riveted, or otherwise fixed, preferably corrugated plates. Each press was made to take sixteen cakes instead of four as with the existing box presses.

The "Cheeseborough" patent, taken out two years before that of Downs, also had sixteen plates. It was rather peculiar that these two people, who knew nothing whatever about each other, should have arrived at a similar result.

Cake-dressing

For sixteen years a great invention had lain dormant. In 1856 a patent was taken out in the name of W. E. Newton, upon a communication from abroad. The patent did not state where the communication came from. Newton described and claimed for a cake-moulding machine and a cake press for making sixteen cakes at one pressing. Thus, the sixteen cake pressing machine existed in substance and in fact. It was almost inconceivable that for sixteen years an invention of that kind should have lain dormant, and that all that time this and other countries should have been struggling with the old "four-box" press.

The first mill built on the "Anglo-American" system was put up by Rose, Downs, & Thompson, of Hull, for Willows & Holt in 1874, and had eight presses, There was also a mill built in the same year for Pearson Brothers, of Gainsborough. It was doubtful which of the two mills ran first. In 1878, Edward Ross Walker took out two patents which might be classed as notable improvements. In one patent he employed a hydraulic accumulator, which was to be worked from a larger or low-pressure pump, and a larger number of presses could be operated with the one pump. The hydraulic moulding machine invented by Ross Walker had a spring head, which permitted the seed to fall from its box.

Later Improvements

The invention of the "Anglo-American" press naturally brought a great many improvements in its train, as the auxiliary machines hitherto used in connexion with the box presses could not deal with the larger output. The grinding machine which was known as the "Anglo" roll was introduced. This consisted of several cast iron rolls placed above each other, having an average of about 16 inches diameter. With an up-to-date set of rolls the operator could see exactly what feed was passing between them. Larger cooking kettles were also employed, and arrangements made for transmitting the seed more quickly from the kettles to the moulding machine, while greater attention was paid to the heating and tempering of the seeds.

An illustration of an automatic machine used in the larger mills was shown. It served twelve presses and was made by Greenwood & Batley, of Leeds. The twelve presses could be quite easily worked by one man. The automatic Anglo-American Cake Paring Machine was practically independent of the workman in regard to its operation. A cinematograph film showing the method of operating modern oil mills and their machinery was shown.

On the motion of Mr. Terleski, seconded by Dr. Callan a vote of thanks was passed to Mr. Bellwood for his lecture.

Photosynthesis of Nitrogen Compounds

Research Work at Liverpool University

At a meeting of the Chemical Society at Burlington House, London, on May 5, Professor E. C. C. Baly read a paper on "The Photosynthesis of Nitrogen Compounds from Nitrates and Carbon Dioxide," which dealt with the experiments which he, Professor Heilbron, and Mr. D. P. Hudson have been making at Liverpool University. The formation in the living plant the great variety of substances on which our food supply depends was, said Professor Baly, one of the most fascinating problems in the science of chemistry. It was peculiarly intriguing, as we knew that the only sources from which the plant could start were carbon dioxide, which it absorbed from the air, and water and nitrates, which it obtained from the soil. With the help of sunlight, the plant, in some hitherto unknown way, succeeded in building up from these simple inorganic materials those complex substances on which all animal life depends. It had long been believed by many explorers in this field of investigation that the first process which took place in the living plant cell was the production of formaldehyde from the carbon dioxide and water; and that the second stage was the conversion of this formaldehyde to simple sugars of the nature of glucose and fructose, these sugars then combining amongst themselves to give cane sugar, starch, and other complex carbo-hydrates, notably cellulose. Two great difficulties had hitherto been found in accepting this theory—first, that no one had succeeded in making formaldehyde from carbon dioxide and water alone; and second, that no free formaldehyde was found in the living plant.

It had now been discovered, continued the lecturer, that the secret of these syntheses was to be found in the way in which the plant utilised the energy of sunlight; and that the earlier investigations failed because they did not understand the conditions of the reactions involved in the supply of the necessary light energy. This mystery had now been solved and many of the vital processes had been successfully reproduced in the laboratories at Liverpool University.

The first advance was made by the late Professor Benjamin Moore, who showed that in the presence of iron, formaldehyde was produced when a solution of carbonic acid was exposed to ultra-violet rays; and he also showed that this formaldehyde was in turn converted into sugar when exposed to these rays. Although this marked a great advance, it by no means explained the vital process involved, since the light of the sun did not contain any of the ultra-violet rays necessary to make the formaldehyde. The secret of this process had now been discovered in the Liverpool laboratories, where it had been found that when certain coloured basic substances were employed carbonic acid could be directly converted into formaldehyde in ordinary sunlight. This was exactly what took place in the green leaves of the plant, since the green colouring matter known as chlorophyl acted in just the same way as did the coloured basic compounds in the laboratory. The ultra-violet rays were, therefore, quite unnecessary, the coloured substance enabling the necessary energy to be absorbed from sunlight.

Manufacture of Artificial Sugar

This discovery had thrown an entirely new light on the whole problem of the life and growth of the plant; and incidentally it showed that the production of sugar was by no means beyond the bounds of possibility. Considerable quantities of sugars had been produced in the Liverpool laboratories, and the investigation of their nature bade fair to explain how the complex carbohydrates, starch and cellulose were made. It also gave one reason to think that before very long their artificial production might be realised.

Another great problem dealing with the formation of nitrogen compounds, such as alkaloids and proteins in the plant, had also been solved. They had recently discovered in the University laboratories that the nitrates which the plants absorbed from the soil combined in the green leaf, in the form of nitrites, with the active formaldehyde. This process had been experimentally reproduced at Liverpool, using ordinary test tubes and employing the light of a quartz-mercury lamp instead of sunlight.

Production of Proteins

Alkaloids had been made, and also those amino-acids which were known to be the basis of proteins. The actual production of proteins was but one stage further; and there was every reason to believe that this stage would soon be passed. The great importance of this advance was the complete understanding of how the plant made its products. The formation of such widely differing compounds as sugars and starches on the one hand, and products such as caffeine, cocaine, and the proteins on the other, was now explained. The elusive processes of plant life no longer savoured of the mysterious; for they seemed to be the inevitable result of sunlight acting on chlorophyl in the presence of carbonic acid and potassium nitrate.

Affairs of the Ludcam Steel Company

The proceedings instituted by the American Stainless Steel Co. against the Ludcam Steel Co., on the grounds that the latter had infringed their patent rights, have resulted in a decision for the defendants. It has been decided that the mixture or formula employed by them is different from that employed by the makers of the steel the patent rights of which are owned by the American Stainless Steel Co. The case was considered of great importance because it was the first of the kind instituted and was a test of the validity of the rights. It is probable that an appeal will be lodged against the decision.

Titanium Oxide Production

A Newly-developed Paint Pigment

In a paper on "The Production of Titanium Oxide and its Use as a Paint Material," read by Mr. Noel Heaton at a meeting of the Royal Society of Arts on May 3, and briefly reported in The Chemical Age last week, the author described the discovery towards the end of the eighteenth century of the mineral ilmenite in Cornwall. This mineral was found to consist of iron-oxide combined with the oxide of a hitherto unknown metal, to which Klaproth, who investigated it some years later, gave the name "titanium." Although some of its compounds were now used industrially to a certain extent, it was popularly classed as one of the rare elements; actually it was one of the most abundant substances on the face of the globe. The metal itself, continued the lecturer, was never found in Nature, but it was present as oxide in almost all rocks. It occurred most abundantly, however, in combination with oxide of iron as titaniferous iron ore or ilmenite. Varieties of this mineral were found in various parts of the British Isles, and enormous deposits existed in many parts of the world. Titanium oxide bore little relation to oxide of iron in its properties.

After describing early experimental work on titanium compounds, the lecturer dealt with the work carried out in Norway by Dr. Jebsen and Professor Farup. After a series of researches extending over some six years, the inventors elaborated a satisfactory process for the utilisation of titanium oxide as a pigment, and a plant capable of producing 8,000 tons per annum commenced operations in 1919. The titaniferous ore found near Egersund, south of Stavanger, consisted mainly of a variety of ilmenite, to which the formula $Fe(Mg)\ Ti\ O_3 + 10\ Fe_2O_3$ had been assigned, together with associated minerals, principally magnetite and apatite, with a small quantity of vanadium. This crude ore was first freed from these associated minerals and impurities by mechanical treatment at the mines, and the concentrate contained titanium oxide to the extent of 47.5 per cent.

Process of Manufacture

The first process in the manufacture was to reduce the concentrate by pulverisation in a ball mill. The powder was then treated with strong sulphuric acid and heated, when a chemical reaction was started, which, once begun, proceeded exothermically, with the result that the mineral was entirely decomposed and converted to a mass containing soluble sulphates of iron and titanium, which set into the form of a hard cake. This coagulated mass was then powdered in a disintegrator and extracted with water. A solution was thus obtained of iron and titanium sulphate which was concentrated to the consistency of syrup and then treated to reduce the iron to the ferrous state. The solution was then heated to just below boiling-point and kept in a state of violent agitation for some hours, when the titanium sulphate broke down; titanic acid was precipitated from the solution as a white powder, leaving the ferrous sulphate in solution. By this means, continued Mr. Heaton, the titanium could be completely separated from the iron, it only being necessary to subject it to a thorough process of washing. Owing to the fact that the precipitate of titanic acid was in such an extremely fine state of division, the ordinary method of collecting and washing the precipitate by means of a filter press could not be utilised, and the more costly method of washing by decantation had to be resorted to.

The pulp was then passed into a rotary furnace of a type similar to that used for cement, where it was, in one operation, dried and calcined to a high temperature. By this means the titanic acid was converted to anhydrous titanium oxide and changed from the amorphous state to a crypto-crystalline condition. The titanium oxide came out of the furnace in the state of small friable nodules, which were finally pulverised and converted into an extremely fine powder by a process of air flotation.

Preparation of Titanium White

In order to prepare the titanium pigment—which was known as titanium white to distinguish it from the pure oxide—further modifications in the process were necessary. It was found that by precipitating the titanium together with barium sulphate, a physical combination of the two was formed which had better pigmenting properties than the pure oxide and was the more economical to produce. The most efficient combination of these two substances was that containing, by weight, 26.5 per cent. titanium oxide and 73.5 per cent. barium sulphate. In practice it was found preferable to form the barium sulphate first and add it in the state of pulp to the solution, and then precipitating the titanium on it by the agitation process. After the combined precipitate had been washed free of iron, and before it was transferred to the furnace, a small proportion of barium carbonate was added to it in order to insure that every trace of free sulphuric acid was removed.

Chemical Properties

Titanium white, as thus produced, had chemical properties which rendered it of the utmost value as a pigment, particularly for the preparation of protective paints. Owing to the fact that titanium oxide was the most chemically stable compound of the metal, the pigment was extremely resistant to destructive agencies. That it would resist the attack of sulphuric acid would be readily conceded in view of the fact that it was actually produced in the presence of free sulphuric acid. It was not liable to discoloration by sulphuretted hydrogen, as titanium did not readily form a coloured sulphide; neither was it readily attacked by sea air or salt water.

Practical Exposure Tests

The author then described in detail a series of exposure tests in which boards painted with paints containing the pigment had been exposed for three years to a direct south aspect at an angle of 45°. The general results of these tests was that paints made with titanium pigment had shown no tendency to crack or peel, but had worn down evenly and uniformly, the surface finally becoming powdery and remaining in an excellent condition for repainting. Owing to the chemical stability of this material, said the lecturer, it was possible to use it for those methods of painting where none but the most permanent of pigments were admissible.

More important from the economic point of view was the fact that on account of this chemical stability it was not readily absorbed into the system if accidentally inhaled or otherwise taken into the body by the painter in the course of his work.

Physical Properties

The physical properties of this pigment, continued Mr. Heaton, were perhaps even more interesting than its chemical properties, the most important from the practical point of view being its extraordinary opacity, which was greater than that of any other known white pigment. This fact was demonstrated by the lecturer by means of boards painted with black stripes, which were totally obscured by an application of titanium white. The high opacity of the latter formed one of its most valuable properties, but the most interesting point of all connected with the physical properties of the material was the fact that combined with the remarkably high refractive index, it had a remarkably low specific gravity.

In conclusion the lecturer said the industrial utilisation of titanium was still in the research state. Considering the enormous stores of the raw material in existence, and the fact that it was now available in a high state of purity in quantities which were only limited by the demand, the utilisation of this substance would usefully form a subject of investigation in many industries. He had in mind, for instance, the glass industry, in which it would seem that titanium oxide possessed distinct possibilities.

Discussion

Sir Thomas Holland mentioned the wide distribution throughout the globe of titanium oxide. On the economic side it appeared to him that the preparation of titanium white involved the use of a cycle of processes all of which were expensive.

Mr. H. O. Weller expressed the opinion that if there was a rival to white lead it was to be found in titanium white.

Mr. W. Hancock said he had never yet come across clays which did not contain an appreciable amount of titanium. He had proved that titanium oxide was an admirable material for resisting the various conditions to which paints were subjected. He referred to the possibilities of applying it other than as a pigment, and thought the fact that titanium oxide could be obtained commercially would be of interest to those concerned in the production of enamelled ware. It also might be used for certain refractory purposes up to a temperature of about 1,600°C.

MR. CRUICKSHANK SMITH bore out the statements of other speakers that there was a great future for titanium white. In the pure titanium oxide he had noticed a certain proportion of sulphuric anhydride and he thought it should be removed.

MR. CHARLES HARRISON said he had found titanium white to be the most opaque of white pigments. He thought that among other things it was suitable as a base for aniline dyes.

MR. J. D. BATTEN said titanium white was just the pigment that painters of pictures were looking for. He was full of hope that it would supply the permanent white colour they wanted.

MR. F. DAKIN suggested that antimony oxide might advantageously be combined with titanium white.

MR. BRUCE ENDERSON said he had considerable experience with the material in the painting of gasholders. He had found that one coat was sufficient, that it wore well, and that the surface was invariably in a good condition for repainting.

In his reply MR. HEATON admitted that the process was a costly one, and that the cost per cwt. of the pigment was also high. It gave better service than other pigments, and, taking various factors into consideration, he was convinced that it was more economical in the long run than others. The pigment might certainly find use as a refractory owing to its high melting point. He wanted to emphasise the fact that barium sulphate was present, not as an adulterant, but as an essential. If they tried further to eliminate the sulphuric anhydride the product was apt to become coarse in texture. If titanium white were used in the glass industry the sulphuric anhydride would be driven off at the higher temperatures. The only impurity that mattered at all was the proportion (0.1 per cent.) of iron oxide. Titanium white alone was slower in drying, but there was no difficulty in overcoming this; the most efficient drier was a combination of lead and cobalt. The actual quantity of ore in sight had been estimated at 30,000,000 tons. The Norwegian factory was capable of producing 8,000 tons per annum. If there were a demand for 20,000 tons there would be no difficulty in supplying that quantity.

U.S.A. Low Temperature Coking Process

THE obtaining of a good grade of coke from coals which seemed devoid of any coking property has been accomplished by investigators at the University of Illinois, Urbana, U.S.A., working in co-operation with the United States Bureau of Mines, by the employment of a specially devised low temperature coking process. As a result of the process, valuable by-products, in the way of ammonia, gas, and tar, are derived.

The experiments were undertaken in connexion with an investigation by the Bureau of Mines of the smoke problem at Salt Lake City, Utah. It was found that coke was regularly obtained from only a few coals tributary to the Salt Lake City district, and if the use of coke, a smokeless fuel, was to be increased in that city it would be necessary to demonstrate the possibilities of coking coals not regularly used for that purpose. Six coals from various Utah districts were tested.

Although, so far as present standards of coking indications are concerned, the coals tested seemed quite non-coking, treatment by the methods devised by Prof. S. W. Parr, of the University of Illinois, resulted in a yield of good coke amounting to approximately 60 per cent. of the coal employed. The coke is dense and of good texture, and seems adapted to use as a domestic fuel and for metallurgical purposes. In some respects the coke seems superior to anthracite for use in domestic furnaces. Slightly more than 20 lb. of ammonia sulphate, valuable as a fertiliser, were recovered per ton of coal coked. The gas recovered as a by-product is especially suitable for utilisation in city mains. The tar oils obtained should lend themselves readily to cracking processes, thereby furnishing a product suitable for motor-fuel purposes, and may also prove a source of creosote oil and other wood-preserving materials. These tar oils, on account of their marked drying properties, may also be available for paint and varnish manufacture. Other uses suggest themselves, such as direct combustion in engines of the Diesel type, as fuel for steam generation, as a source of heat for metallurgical purposes, the carburetting of water gas, and as the source of pitch as a binder for the briquetting of breeze, lignite fuels, etc.

The results of the investigation are of two-fold importance, indicating the possibility of coking many coals not generally considered to have coking qualities, and also constituting a factor in the solution of the smoke problem in communities not favourably situated for the obtaining of smokeless fuel.

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Society of Public Analysts

AT an ordinary meeting on May 3, held at the Chemical Society's Rooms, Burlington House, London (Mr. P. A. Ellis Richards, president, in the chair), certificates were read for the first time in favour of Messrs. Archibald Steele Whamond and Thomas John Ward. A certificate was read for the second time in favour of Mr. Frederick Major, B.Sc. (Lond.), A.I.C. The following were elected members of the Society: Messrs. William John Agnew, B.A. (R.U.I.), Arthur Thomas Etheridge, M.B.E., B.Sc. (Lond.), F.I.C., Reginald Ernest Essery, B.Sc. (Bristol), A.I.C., George Girvan Herbert, A.I.C., George Lewis Hutchison, B.Sc. (Lond.), F.I.C.

Abstracts of Papers

A paper on "Studies in the Titration of Acids and Bases," by J. L. Lizius, B.Sc., A.I.C., and Norman Evers, B.Sc., A.I.C., stated that the application of the newer indicators to the ordinary titrations of acids and bases had been studied, and new indicators or combinations of indicators were recommended giving sharp colour changes at the end-point and greater accuracy of results than the indicators commonly in use. Methods of determining the hydrogen ion concentration of the true end-point of a titration were described and a table of titrations was given showing the hydrogen ion concentration of the end-point, the best indicator, the sharpness of the end-point and the accuracy to which results could be obtained.

In a paper on "Graphites and other Pencil Pigments," by C. Ainsworth Mitchell, M.A., F.I.C., further details were given of the author's microscopical method of examining graphites, the results being compared with the chemical composition of various graphites and pencil pigments (old and modern), including a specimen of graphite from Egypt (B.C. 1500). Analyses were also given of the pigments in typical coloured pencils, and their differentiation in markings on paper was discussed.

Dealing with the "Inadequacy of 'AR' Test for Alkalies in Calcium Carbonate," the authors (W. Singleton and H. Williams) found that the "AR" method for determining alkalies in calcium carbonate was inadequate and required revision, as in several samples of "AR" quality they found that only about 10 per cent. of the total alkalies present in the calcium carbonate were removed by one extraction with distilled water according to the "AR" method. Even after five extractions of the substance with water, only about 15 per cent. of the total alkalies present were removed, and only about half the total of five extractions was removed by the first treatment.

In a paper on "The Sulphuric Acid Reaction for Liver Oils, and its Significance," by J. C. Drummond, D.Sc., F.I.C., the author stated that the chromogenic substance giving the characteristic colour reaction appeared to be a normal constituent of the liver; he had found it present in the liver of man and twenty-one other animals. It seemed to have a distinct relationship to Vitamin A, for example a number of samples of cod-liver oil of known purity, classified according to intensity of their colour reactions with sulphuric acid, were found to be also classified in the order of their Vitamin A content. The colour reaction was correspondingly feeble for oils obtained from animals deprived of Vitamin A. Attempts to trace the origin of the chromogenic substance in the food of the cod failed. The few properties of the substance which were known, as well as the available data regarding its distribution, showed certain resemblances to the unidentified Vitamin A. Without assuming the identity of the two factors, the author suggested that the association might be of significance.

Professor Svedberg going to U.S.A.

PROFESSOR SVEDBERG of the University of Upsala, who will be remembered as a prominent figure at the London Conference on Colloid Chemistry, is going to the United States to teach and to engage in research work with American chemists. Professor Svedberg will be at the University of Wisconsin the second part of the coming school year and at the summer session of 1923. This announcement is made by Dr. J. H. Mathews, director of the course in chemistry at the University of Wisconsin, through the American Chemical Society. While at Wisconsin Professor Svedberg will organise and direct the research work in colloid chemistry and will give two lectures each week on the subject. He also will conduct classes devoted to the broader aspects of colloid chemistry and to its biological applications.

Esthonian Oilshale

Commercial Possibilities of a Rich Deposit

In a paper on "Kukkersite, the Oilshale of Esthonia," read at a meeting of the Institution of Petroleum Technologists, held on Tuesday, in the rooms of the Royal Society of Arts, London, Mr. E. H. Cunningham Craig said the Esthonian oilshale was the oldest oilshale in the world that was being worked, that it was the richest oilshale known, and that it occurred under extraordinarily simple conditions. In speaking of the richest oilshale torbanites were necessarily excluded and thus the famous deposits of New South Wales, South Africa, Nova Scotia, France, &c., sometimes popularly but erroneously spoken of as oilshales, did not come within the subject under consideration.

The shale, continued Mr. Craig, was a fine grained deposit varying from a warm grey to an olive-green in colour when fresh, but weathering a bright reddish-brown. It had a sandy appearance and fracture which was quite illusory, as microscopic examination showed that there was not a grain of sand in it. It was crowded with fossil remains, chiefly in small fragments, but on bedding planes several species, chiefly trilobites and brachiopods, could be recognised. Under the microscope the matrix appeared to be very homogeneous and very finely granular, and all fully and evenly impregnated with a bright yellow kerogen. The fragments of fossils were not impregnated. Somewhat obscure flocculent red masses were identified as particles rich in ferrichydroxide in the weathered portions, and suggested that there has been some precipitation or concentration of iron compounds in a flocculent colloidal state. The specific gravity of the shale varied between 1.2 and 1.4, but was naturally affected by the quantity of fossil fragments (calcite) present. As compared with other oilshales the fresh yellow colour of the impregnation was remarkable in so old a rock. It was much fresher and apparently less inspissated than the brown kerogen of the Scottish shales or the brilliant burnt sienna-coloured kerogen of the New Brunswick shales. In fact the bright colour was most nearly paralleled by that of the richest shales of Colorado.

Chemical Analyses

Chemical analyses of the inorganic contents of the shale were very interesting. Many analyses had been made, but they showed great variations, due almost entirely to the varying quantities of carbonate of lime (fossil fragments) contained. It was obvious, said the lecturer, that to get an average sample a large bulk of the material must be ground fine and quartered, while to obtain any reliable data as to the composition of the matrix—which contained the kerogen—a specimen as free as possible from fossil fragments should be selected. From a series of analyses made in the Central Laboratory of the Esthonian Republic, the composition of the mineral matter was given as follows: Silica, 32.74 or less; alumina, 15.76 or less; iron oxide, 1.68 or less; lime (or calcite), 49.64 or more. This was a very high percentage of lime, almost all of which might be put down as fossil debris. Other analyses of dried material gave magnesium and sodium and potassium, taken together, .4 per cent., and water, 1.2 per cent.

Many analyses of the shale had been made to determine the percentages of volatile matter, ash, &c., but they showed extraordinary variations. This was probably chiefly due to the methods that had been employed and the temperatures to which the material had been subjected.

The volatile percentage had been given by different chemists as anything between 52.5 and 65 per cent., while "coke" or "fixed carbon" was stated at from 5 to 11 per cent. The reason for these differences was that if quickly subjected to a high temperature destructive distillation took place with the deposit of free carbon; later at a higher temperature the free carbon, finely divided and closely associated with lime carbonate, reacted with it, giving off carbon monoxide and thus increasing the volatile percentage, which, of course, also included the moisture present.

From all the data available it seemed that we might take the average volatile percentage at from 54—56, which was extraordinarily high for a shale. Analyses of the organic contents by different authorities gave the following:

Carbon	70.52	..	72.82
Hydrogen	7.20	..	8.66
Nitrogen	0.30	..	0.68
Oxygen	21.98	..	16.24
Sulphur	—	..	1.60

The remarkable points to be noted were the fairly low nitrogen percentages and the very high oxygen, which suggests either that there was some water present or that the bituminous matter were highly oxidised and inspissated. The carbon-hydrogen ratios were 9.8 to 1 and 8.4 to 1 in the two cases. These were both very low, and would place the material among well inspissated manjaks such as W. Virginia Grahamite and Albertite from New Brunswick. It would be noted that the lowest C-H ratio was from the analysis showing the lowest oxygen; this suggested less inspissation, but still there was a probability that some water was present. The sulphur percentage 1.60 was not high for such material, and compared favourably with Dorset and Norfolk shales. Extractions with carbon disulphide and carbon tetrachloride in a Soxhlet apparatus gave .9 per cent. and .8 per cent soluble, according to Dr. Dunningham, results that proved that in spite of its fresh appearance the organic material was very highly inspissated. It was quite evident, said Mr. Craig, that much chemical work required to be done on this interesting shale before it could be said to be fully understood.

Commercial Possibilities

Dealing with the commercial development of this remarkable oilshale, Mr. Craig said it had been proved in workable thickness at intervals for a distance of 36 miles from east to west, and seven miles from north to south, but to make any estimate of the tonnage available would perhaps be premature. In one locality a tonnage of over five million per square mile was assured, but this was perhaps too much to expect over a large area. Three million tons per square mile had been proved over a fairly large area, and 2 or 2½ million might be taken as a very conservative estimate.

An Esthonian geologist had estimated the total available tonnage at over 3,000 million, but the author, taking account of the variations in thickness to which fuller's earth deposits were liable, was not prepared at present to estimate the shale in sight at more than 1,000 million tons, though recognising that further excavations might prove a very much larger quantity.

For many miles, in fact all along the outcrop and for some miles southward the shale could be worked by open cut. A steam navvy was used to remove the superficial deposit of sand, from 3 to 6 ft. in thickness, and then the shale was quarried by hand labour, the limestone bands picked out, and the shale loaded in trucks. At present the Government were winning about 700 tons per day, and it was used chiefly for fuel, while the fines and smalls were sent to the cement works at Kunda, where in a crushed state the material was blown into the rotary kilns, giving a white hot flame, while the ash was incorporated in the clinker bringing it to the requisite chemical composition. It had been estimated that with a well-laid-out scheme of excavation the shale could be delivered at retorts at a cost of from 4s. to 5s. per ton.

In winter, mining would have to be undertaken some two or three miles to southward of the outcrop, but the mining would be very cheap as the cost of clearing over-burden would be obviated. The seams of shale had a good roof and floor of limestone, and what timber was necessary could be supplied from the immediate neighbourhood. An output of one, two or three thousand tons per day could easily be arranged for, and labour was cheap and plentiful. With a yield of at least 70 gallons per ton, perhaps as much as 80, of an oil from .92 to .93 sp. gr., and containing but a small percentage of sulphur, refining should not be difficult nor expensive, especially as solid paraffins would be almost entirely absent.

In conclusion the author said that although commercial details were outside the scope of his paper, the development and retorting of this shale and the refining of the crude oil were matters of great importance, not only to the Republic of Esthonia, but to the world at large, and very great commercial possibilities, about which he had no wish to make his predictions public at present, were in sight.

A Business Change

We are informed that the Lassen Meter & Engineering Co. has been acquired by James Gordon & Co., Ltd., of Windsor House, Kingsway, London, W.C.2. Mr. J. J. Lassen has accepted the position of joint managing director, and will personally conduct the section of the business dealing with boiler efficiency appliances and instruments. The latter company also specialise in the design and manufacture of water power plant.

Iron and Steel Institute

Award of Carnegie Research Scholarships

THE award of the Carnegie Research Scholarships for 1922 was announced at a meeting of the Iron and Steel Institute on May 5. Grants of £150 each were awarded to: Dr. Arthur Bramley, to assist in studying the carburising and decarburising effect of different gases on iron and steel. Mr. A. L. Curtis, to carry on researches in steel moulding sands and their behaviour under high temperatures. Mr. O. W. Ellis, lecturer in metallography at the University of Toronto, for studies in the effect of constitution on the malleability of iron and steel at high temperatures. Dr. J. Newton Friend, Lecturer at the Birmingham Technical School, to continue his corrosion tests on a large scale. Mr. A. M. Parking, of Sheffield University, for studies in the metallurgy of tungsten. Mr. G. Phragmen, of Stockholm, to study the specific weight of molten metals by new methods. Mr. W. E. Williams, to study the application of X-ray spectrography to the examination of the structure of steel.

Abstracts of Papers

Mr. D. L. Selby-Bigge, in a paper on "Recent Developments in Power Production" directed attention to the reduction of labour and economy effected by using pulverised fuel. In a paper on "X-ray Studies of the Crystal Structure of Steel," Dr. A. Westgreen and Mr. G. Phragmen said they had succeeded in determining the structure of delta-iron at 1425°C. They showed that iron within the so-called beta and delta ranges has a body-centred cubic structure, and within the gamma-range a face-centred cubic structure, the transformation taking place at 900°C., being reversed at 1,400° C. The gamma-iron lattice of austenite steels was shown to be enlarged by the dissolved carbon. Photograms of cementite and of the well-known crystal tablets of spiegel iron had been found to be identical, the cementite belonging to the orthorombic system.

Mr. J. H. Whitley discussed "The Formation of Globular Pearlite." He found that the cementite constituent of pearlite did not at once completely dissolve at the actual transformation point, but persisted even at higher temperature, according to the size of the crystal grain. On cooling, the cementite nuclei caused the pearlite to form in spheroidal instead of in the lamellar structure. This latter seemed to require a certain degree of supersaturation to produce it. The presence of the globular pearlite induced an earlier growth of lamellar pearlite in adjoining parts of the solid solution which might happen to be free from nuclei.

Mr. N. Yamada devised a new form of calorimeter for high temperature, whereby he determined "The heat of transformation of austenite to martensite and of martensite to pearlite." In his paper he also showed from the results of testing steels with different carbon content, that the value, obtained increased progressively with the carbon content, amounting to 5.6 calories per gramme for eutectoid steel. The specific heats of troostite, sorbite, and pearlite were shown to have the same value within the limit of experimental error. He further found that the heat of dissolution of carbon in iron increased linearly with the carbon content, and amounted to 1130 calories per gramme of carbon.

In a paper on the "Hydrogen Decarburisation of Carbon Steels with Considerations on Related Phenomena," Mr. C. R. Austin gave an account of the influence of time and temperature on the rate of decarburisations by hydrogen plain carbon steels of varying carbon content, and on the configuration of the recrystallised ferrite grains constituting the decarburised fractions. A study of the crystal grain structure of the carbon-free periphery had yielded interesting results, the most striking being the manner in which the initial carbon-content of the shells so profoundly affected the configuration of the crystal grains comprising the hydrogen decarburised material when the removal of the carbon was effected at a subeutectoid temperature. Some experimental consideration had also been given to the effect of temperature on the rate of diffusion of carbon or carbide of iron, in iron; in all instances the medium employed was a partially decarburised hypereutectoid steel presenting a micro-structure consisting of a completely decarburised peripheral zone surrounding an apparently unaltered cone. The results of this phase of the work were recorded and discussed in the light of the work of previous investigators, reasons being stated for the conclusion that *a*-iron must have a real solubility for carbon or carbide of iron; the degree of solubility depended on the temperature, but data had not yet been obtained which admitted of a numerical expression for this solubility. In conclusion, the author stated that decarburisation with a temperature gradient maintained along a steel specimen had incidentally provided one or two ulterior interesting features; the microstructure of a piece of iron wire which had remained in the furnace during decarburisation presented a very interesting appearance and presumably provided an example of decarburisation preceded by carburisation in the same furnace and under similar conditions.

Chemical Trade Improving

Mr. Max Muspratt's Encouraging Testimony

THE number of business men who speak with confidence of reviving trade and the number of industries whose order books are gradually fattening are (the *Liverpool Daily Post* states) on the increase. Mr. Max Muspratt, chairman of the United Alkali Co., Ltd., one of the largest chemical manufacturing firms in the world, is one of the optimists whose faith appears to be in process of justification. In what may be termed a lightning interview, he was in quite a cheerful mood:—

"And how is business?"

"Oh, better; distinctly better."

"A bigger volume of orders coming in?"

"Yes. I have just been looking through our books, and I find we are going to be much busier than we have been."

"Foreign orders?"

"Yes. The home demand, too, is brisker."

"Which foreign countries are wanting your goods?"

"South America, and the Orient—Japan, China and India. And the Levant—Egypt, Palestine—no, Palestine does not take much; but Asia Minor, Greece, and the Balkan countries."

"What of Europe generally?"

"Improving. Even Germany is nibbling at our heavy chemicals."

"Germany importing British chemicals? Is she cut off from her raw materials?"

"No, I don't think so. I don't quite understand it, but there it is. It is probably a question of transport, which is in a pretty bad way."

"What of Genoa, and its effect on trade?"

"I think good will result from the meeting of the representatives of so many countries."

"Even if they have met only to quarrel?"

"Yes. I think we may hope that the exchange of views will do good commercially. Anyhow, the chemical trade is improving, and that trade, as you know, is a pretty good barometer of commerce generally."

Cellulose Holdings and Investment Co.

THE Cellulose Holdings and Investment Co., Ltd., was registered on May 4 as a public company with a nominal capital of £50,000 in 1s. shares. The objects are: To acquire, hold, sell, dispose of, deal with and turn to account debentures, debenture stock, bonds, or other obligations of, and preference and ordinary shares or other interests in the British Cellulose and Chemical Manufacturing Co., Ltd., or any other companies, associations or firms (British or foreign) concerned in the manufacture of cellulose or artificial silk or dyes and dyeing, and to enter into, carry out, vary and rescind deeds, agreements or arrangements with the British Cellulose and Chemical Manufacturing Co., Ltd., for the payment by the last-named company to this company or its assigns of royalties or periodical or other payments of any kind, to carry out underwriting and financial operations, to carry on business as manufacturers, producers, importers, exporters, merchants and brokers of chemicals, drugs, colours, dyestuffs and pharmaceutical preparations, etc. The minimum cash subscription is seven shares. The subscribers (each with one share) are: J. Clancy, 124, Westcliff Park Drive, Westcliff-on-Sea; A. E. Gude, 30, Adelaide Road, Hampstead, London; J. C. Parham, 17, Ascot Road, Tooting Junction, London; H. B. Smith, 4A, Pages Lane, Muswell Hill, London; and three clerks. The first directors (qualification, £50) are to be appointed by the subscribers, but, pending such appointment, the subscribers themselves are deemed to be directors except as regards requiring qualification. The directors' remuneration is £100 each per annum (chairman, £100 extra); also, whenever more than £25,000 is distributed by way of dividend, a further 10 per cent. on the excess over £10,000 so distributed; but the total additional remuneration in any year is not to exceed £6,000. The registered office is 41, Threadneedle Street, London.

Salar del Carmen Nitrate

Increasing Demand for Production

SPEAKING at the twenty-fifth annual general meeting of the Salar del Carmen Nitrate Syndicate Ltd., held on May 4, at Winchester House, London, Mr. H. W. Sillem (the chairman) said the results must be considered satisfactory, particularly in view of the fact that the quantity of nitrate dealt with, namely 231,000 quintals, was small compared with that of immediately preceding years. The stock of nitrate on hand at December 31 last consisted of 271,387 quintals, valued at £51,401, some of which had already been sold at good prices, and they were expecting the Producers' Association to place the remainder at a figure which should leave a fair margin of profit. He was glad to say that they had not found it necessary to shut down the oficina. Their policy during the year had been to continue production on the smallest scale compatible with economical working, thus providing themselves with cheap nitrate pending the resumption of sales. After a lengthy period of stagnation the market had recently developed activity, and prospects were certainly better than they had been for a long time. There was a demand from all quarters, including Germany, for chemical fertilisers, and as there was a shortage of competing articles—sulphate of ammonia and synthetics of various descriptions—nitrate of soda was being asked for and sold in fairly large quantities.

The Trade Outlook

The production of sulphate of ammonia, said Mr. Sillem, was likely to be on quite a small scale for some time to come, and, with regard to synthetics, it was interesting to know that, far from the Germans being able to carry out their intention of exporting those products to neighbouring countries, they had not been able to produce sufficient for the requirements of their own country. Chilian nitrate had been sold to Germany for this season's delivery, and it seemed highly probable that next season's trade in that market would be considerable. In the United States demand was good and might easily become very large. Indeed, some well-informed people estimated that the time was not far distant when the United States would absorb practically the whole of the nitrate production of Chile.

There were many favourable signs, the most important of which was the increasing demand for nitrate; but it was only fair to add that owing to the long period of inactivity in the trade there was a disposition in some quarters to liquidate a portion of accumulated stocks at a much lower range of price than had been usual during the past few years. The total supply in sight on April 30 last was approximately 1,980,500 tons, of which 1,495,000 tons were in Chile, 393,500 tons in Europe and Egypt, and 92,000 tons in the United States and other countries. The total of 1,980,500 tons compared with 1,219,000 tons at April 30, 1914. To reach a more or less normal position existing stocks should be reduced, and the manner in which this could be brought about was now under discussion by the Nitrate Producers' Association. Once surplus stocks were disposed of prices should rise to a point where the average producer could work at a reasonable profit. Owing to the richness and extent of its grounds their company was able to face the future with equanimity, particularly in view of its strong financial position.

Conference of Works Magazine Editors

MORE than sixty editors of works magazines attended the second Conference of Works Editors at the offices of the Industrial Welfare Society recently. It has generally been found that magazines of this kind will prove a valuable stabilising influence in industry. They form a common platform where all sides can voice their views; they help each side to appreciate the difficulties of the other; they arouse interest in the most mechanical operations; and develop that spirit of goodwill which is essential to the real efficiency of industry. The general opinion of the conference was that the factory magazine should be non-political and that it should contain no deliberate propaganda of any kind. Although the conference was mostly concerned with magazines for general circulation among the employees of large firms, an instructive paper was read on the subject of "Journals for Administrative Staffs," which emphasised the importance of placing essential facts concerning their own firms and industry generally, not only before directors, managers, and departmental heads, but before foremen and others who came into more direct contact with the workers.

A Chemical Manufacturer's Affairs

A MEETING of the creditors of Alfred Prescott, trading as Prescott & Co., Sowerby Bridge, Yorkshire, Holt Town and Rutland Mills, Hulme, Manchester, chemical manufacturers and merchants, was held on May 4 at Manchester, when a statement of affairs was presented which showed total unsecured liabilities of £45,005 10s. 2d. The indebtedness to the unsecured creditors was £28,645 5s. 5d., and the bank were shown as partly secured creditors for £16,360 4s. 9d. There were also fully secured creditors for £600, who held securities valued at £800. The assets were estimated to realise £8,053 1s. 5d., from which had to be deducted £258 14s. 8d. for preferential claims, leaving net assets of £7,776 6s. 9d. or a deficiency of £37,229 3s. 5d. The assets comprised cash at bank, £1,285 1s. 5d.; stock, £4,653 5s. estimated to realise £2,900; loose plant, tools, utensils, &c., £2,275 11s. 2d., expected to produce £400; office furniture, £824, valued at £300; waggons, carts, sheets and harness, £209 8s. 7d., estimated to realise £150; excess profits duty, recoverable, £1,800; book debts, £1,405 3s. 6d., expected to produce £1,000, and surplus from fully secured creditors, £200. With regard to the unsecured liabilities it was pointed out that they included a claim by Mr. C. Vermeire Van Geeteruren of £10,400, while Kemball Bishop & Co., Ltd., were creditors for £10,990 in respect of differences. The stock, plant, &c., was at the company's premises at Sowerby Bridge, Holt Town, and Rutland Mills. It was stated that it was proposed to form a company with a title embodying the word "Prescott" to acquire all the assets except the Triangle Works, Sowerby Bridge, the assets at Holt Town, and the Manchester warehouses. The bank would be asked to accept these particular assets in settlement of their debts subject to the granting of certain leases. The new company would issue debentures, preference, and ordinary shares, either of which would be offered to creditors for acceptance in settlement of the debts, provision being made for the allotment of such stock. Debentures would also be issued to provide further working capital. It was understood that the proposed company would confine its attention to the merchanting side of the business, and that Mr. Prescott would be a director of the new company, together with a representative of the creditors. Approval was expressed of the proposed scheme.

Uses for Slate-Waste

As a result of investigations and experiments made by Mr. Oliver Bowles, the mineral technologist of the U.S. Bureau of Mines, the waste products of slate quarries are now recognised as of very great commercial use. Some of their chief uses are: As road-building material; as a substitute for whiting, clay, ground barytes, aluminium flake; as a filler for rubber goods and paint; but the field they cover is exceedingly large, and ranges from asphalt to ornamental flooring, and pottery. It is estimated that in the North Wales slate dumps alone there is "material enough to solve the housing problem for the whole of the country, and to do it cheaply." Experiments in the commercialising of these materials have been carried out at Bethesda for two or three years, and are reported to have been very successful. Both this country and America are beginning to realise the commercial value of slate-waste, and Continental quarry-owners have lately manifested great interest in the experiments conducted.

Chemistry Degrees at Edinburgh

AT a half-yearly meeting of the General Council of Edinburgh University on May 3, Dr. Alexander Morgan said in reference to the proposed degrees of B.Sc. and D.Sc. in technical chemistry that that would make the eighth branch in which the University could grant such degrees in science. There were very few universities which could offer such a degree, as they had not the necessary equipment. One reason why the University was able to offer the degree was not only because of its own fine equipment for the teaching, but because it proposed to use the resources of other institutions such as the Heriot-Watt College. It was a very commendable policy to prevent overlapping, and to utilise without unnecessary expenditure the facilities that were in existence for the teaching of science. They hoped that by next session it would be possible for students to get at Edinburgh University as high a training as could be given in any branch of applied or technical chemistry. The motion to approve of the draft ordinance was agreed to.

Relation of the Elements

Lecture by Sir Ernest Rutherford

PROFESSOR SIR ERNEST RUTHERFORD, F.R.S., delivered the twelfth annual May lecture to a crowded meeting of members of the Institute of Metals on Wednesday, May 3, at the Institution of Mechanical Engineers, Westminster. Mr. Leonard Sumner, M.Sc., President of the Institute, was in the chair, and was accompanied on the platform by officers of the Institute, including Professor H. C. H. Carpenter, F.R.S. (past-president), Sir John Dewrance, K.B.E. (vice-president), Dr. W. Rosenhain, F.R.S. (vice-president), Professor T. Turner, M.Sc. (vice-president), Mr. L. Archbutt (member of council), Dr. H. W. Brownsdon, M.Sc. (member of council), Engineer Rear-Admiral R. B. Dixon, C.B. (member of council), Professor C. A. Edwards, D.Sc. (member of council), Dr. R. S. Hutton (member of council), Mr. F. C. A. H. Lantsberry, M.Sc.Tech. (member of council), Mr. W. Murray Morrison (member of council), Mr. H. A. Ruck-Keene (member of council), Mr. A. E. Seaton (member of council), Dr. R. Seligman (member of council), Mr. F. Tomlinson (member of council), Mr. H. B. Weeks (member of council), and Mr. G. Shaw Scott, M.Sc. (secretary).

Sir Ernest Rutherford said that very rapid strides in the growth of our knowledge of the constitution and relation of the elements had been made in the last decade. It had become clear that the atoms were electrical structures of the same general type, consisting of a minute but massive charged nucleus surrounded at a distance by a distribution of negative electrons. The work of Moseley had shown that an unexpectedly simple relation existed between the elements. Apart from its mass, the properties of an element were defined by a whole number which represented the charge on the nucleus and the number of the outer-electrons. This number also gave the ordinal or atomic number of the element arranged in order of increasing weight. All the known elements were defined by numbers starting from 1 for hydrogen and ending at 92 for uranium, and only a few numbers were missing. The discussion of the structure divided itself into two parts, one the laws controlling the position and movements of the outer electrons, and the other the constitution of the nucleus. After reference to the recent remarkable theories of Bohr to explain the distribution and motion of the electrons and the origin of the periodic variation of the properties of the elements, attention was directed to the structure of the nucleus which was of great complexity in heavy elements. The evidence derived from a study of the disintegration of the radioactive elements showed that the nucleus contained both helium nuclei and electrons, but no sign of the emission of hydrogen nuclei had been observed.

The atoms of the elements were very stable structures, and in order to break them up it was necessary to use concentrated sources of energy to overcome the powerful forces holding the nuclei together. The most suitable agent for attack was the swift alpha particle from radium. The atoms were bombarded by a stream of alpha particles, and occasionally one of the latter passed close enough to a nucleus to effect its disruption. Experiments made by Dr. Chadwick and the speaker showed that in this way swift hydrogen nuclei were liberated from the atoms of nitrogen, fluorine, sodium, phosphorus, and aluminium, but the amount of disintegration was on a very minute scale.

It seemed clear that hydrogen nuclei were constituents of the nuclei of these atoms and were in all probability satellites of the main system. It was believed that the helium nucleus was a secondary structure built up of four hydrogen nuclei, and that consequently the nuclei of all elements consisted ultimately of an ordered structure of hydrogen nuclei and electrons. The arrangement of the parts composing the nucleus and the forces operative were quite unknown, and the difficulties of direct attack on this problem of nucleus structure were very great.

The meeting concluded with a vote of thanks to Sir Ernest Rutherford, proposed by the chairman, and seconded by Dr. W. Rosenhain.

Demand for Fiscal Assistance

IN a letter to the *Times* last week, Mr. E. J. Boake pointed out that notwithstanding the importance of dyes to the community they only form one branch of the fine chemical industry and that there are many substances other than dyes which require fiscal assistance at the present time.

Kent Iron Ore

To the Editor of THE CHEMICAL AGE

SIR,—In his presidential address at the annual meeting of the Iron and Steel Institute, Mr. Francis Samuelson stated that "If and when the Kent Coalfield has further developed, a big steel industry may be established on either side of the Channel, based on an interchange of the ores of Normandy and Brittany, and perhaps also of the Eastern field of France, with the Coal of Kent." I venture to submit that Mr. Samuelson has overlooked the potentialities of the Kent mineral field as a source of supply of iron ore as well as a coking coal.

Mr. E. O. Forster Brown, a member of the Iron and Steel Institute, in his evidence before the Coal Commission (Coal Industry Commission, volume 2, pp. 715-717), stated that he was acting in Kent as consulting engineer to Messrs. Dorman, Long & Co., Ltd., Messrs. Bolckow, Vaughan & Co., Ltd., The Channel Steel Co., Ltd., and Mm. Schneider et Cie, of Le Creusot, and estimated that 105 sq. miles (of the coalfield) contain an average of 23 ft. of coal of good average quality in seams of 3 ft. thick and upwards within a depth of 3,000 ft. from the surface, also "a deposit of iron ore which, in conjunction with the development of the coal, it is considered can be converted into iron and steel successfully at competitive prices."

Further on he stated that "The Channel Steel Co. has spent a large sum of money, through the companies of which it forms the fusion, in proving the existence and character of an important deposit of iron ore in the south-west of the field. To enable this iron ore to be turned into iron and steel, an adequate supply of fuel is necessary, and with this object in view Messrs. Dorman, Long & Co., Ltd., who hold a large interest in the Channel Steel Company, have acquired an area of 4,700 acres of coal from the Betteshanger Boring Co. This area has been proved by boreholes within and around it to contain approximately 140,000,000 tons of coal in workable seams of 3 ft. thick and over, within limits of 1,500 and 3,000 ft. from the surface. To recoup themselves for their expenditure, the Channel Steel Company will require to spend a sum of at least one and a half million pounds in blast furnaces and steel works, and a further sum of from one to one and a half million pounds in developing the Betteshanger area and providing the necessary coke ovens to supply the blast furnaces with fuel, and the steel works with gas. They will, however, require security of tenure and freedom as regards management to enable them to develop and work these coal reserves, upon the successful development of which the success of an iron and steel industry in Kent, likely to be of great national importance, is dependent. . . The fact that it is proposed to put up plant to manufacture iron and steel in Kent will also create a demand for iron ores from abroad, and the economies in sea freight resulting from the carriage of coal worked by French interests in Kent to French ports and the return carriage of iron ore, as for instance from north-west France and Brittany, to iron and steel furnaces in Kent, is one of importance in looking at the development of this field from a national point of view."

The bed of iron stone which is found throughout the south-western section of the field was proved to be 22 ft. 6 in. thick in the neighbourhood of Martin Mill, where it was met at a western section of the field was proved to be 22 ft. 6 in. the depth of 365 yards. In this area it overlies about 55 ft. of workable coal.

On analysis the percentage of iron ore was found to be fairly consistent, varying from 29.55 to 33.0 per cent. The phosphorus is somewhat variable, being as high as .72 per cent. at one particular part of the ore and lower in others. On calcination, the material gave 43 per cent. iron (average); the sulphur content was found to be .063. This ore should be quite satisfactory for the manufacture of basic pig; it is practically self-fluxing and with 43 per cent. of iron (calcined) is quite workable and should give about a 2 per cent. phosphorus pig. Recent tests by one of the foremost steel-making firms in Northern France have shown that the coal at present being worked in the Kent Colleries makes a good metallurgical coke (*beau coke metallurgique*).

To those of your readers who are interested in the subject, I would recommend the perusal of Chapter 6 of the "British Coal Trade," by Mr. H. S. Jevons.

Yours etc., Lieut. Colonel R. H. F. STANDEN.

London, May 9.

Chemical Matters in Parliament

Dyestuffs Act Amendment

MR. BRIDGEMAN (House of Commons, May 2) informed Captain Wedgwood Benn that the Government did not intend to introduce an amendment to the Dyestuffs Act on account of the London memorandum of the experts, which stated that the limitation of import should be effected by the medium of Customs duties rather than by a system of prohibition modified by licences. Dyestuffs constituted one of those special cases which the memorandum expressly contemplated.

British Cellulose Co.

In reply to Mr. Ormsby-Gore (House of Commons, May 2), Mr. Young said the Government decided to surrender 750,000 preference shares in the British Cellulose and Chemical Manufacturing Co., Ltd., as it was indispensable to the company to have further working capital unless they were to go into liquidation, and the Government arrived at the conclusion that it would be preferable to relinquish these shares rather than permit liquidation or contribute further capital. The shares surrendered were practically of no realisable value.

Replying to further questions by Messrs. Wise and Maclean (May 2 and 4), Mr. Young said he was not aware that two or three months ago the Government's shares in this company were valued at over £200,000. The preference shares surrendered by the Government would form one of the assets of the company subscribing to the new debenture issue. A sum of £1,450,000 was advanced by the Government to the company during the war towards the cost of plant, &c. It was secured by mortgage; but the whole assets of the company after the war would, if sold, have realised only a small part of the sums advanced. The acceptance by the Government of preference shares in lieu of the existing mortgage and debentures saved the company from going into liquidation. This action was taken on the advice of the Minister of Munitions and of his technical advisers.

Lord H. Cavendish Bentinck (House of Commons, May 8) asked the Financial Secretary to the Treasury what was the amount of the goodwill, patents, and patent rights in the new organisation of the British Cellulose Co.

Mr. Young said this item stood at £1,885,738 in the balance sheet of June 30, 1921. As to the present position he had no information beyond that contained in the report of the board of directors and in the chairman's speech at the annual general meeting on May 1.

Mr. Young later informed Mr. Kiley that Sir Philip Henriques and Sir William Alexander still represent H.M. Government on the board of the company, that the fees received by them from the company were payable to the Exchequer, and that it would not be desirable to dispense with the services of these two directors and for the Government to cease all connexion with the concern.

In answer to Mr. Wise (House of Commons, May 9), Mr. Young said that during the last financial year of the British Cellulose Co., ending on June 31, 1921, there were twenty-two directors' meetings. Sir Philip Henriques attended all meetings and Sir William Alexander seventeen.

French and German Dyes

In reply to Major Barnes (House of Commons, May 4), Mr. Baldwin said he had no reason to suppose that an arrangement (similar to that reported to have been made between La Compagnie Nationale des Matières Colorantes et des Produits Chimiques and the Interessen Gemeinschaft) between the British Dyestuffs Corporation Ltd., and the Interessen Gemeinschaft was contemplated by the former.

Reports of Committees

Answering Mr. Terrell (House of Commons, May 4), Mr. Baldwin said it was proposed to present to Parliament the reports received from committees under Part II. of the Safeguarding of Industries Act, and to publish them in the ordinary course. He did not think it desirable now to make any general statement regarding their nature or contents.

Importation of Dyestuffs

Sir William Barton (House of Commons, May 4) asked the President of the Board of Trade whether his attention had been called to an application made by W. T. Alexander, of 6, Brown Street, Manchester, for a licence to import a small quantity of algole 5G powder; whether he was aware that the applicant was informed by the Licensing Committee that a similar product could be obtained from the British Dyestuffs Corporation, Ltd., from whom he obtained a sample; whether the Board were aware that this sample was tested by the consumers, who reported to the Licensing Committee that the proposed substitute was not so pure and rich in tone as algole 5G, and that its properties as regards fastness were not so good; whether he was aware that the price reckoned on the basis of price per lb. and tinctoral value was more than three times that of the colour asked for, and that the consumers had no desire to get colours abroad if they could be reasonably supplied at home; and whether he would give instructions to grant a licence.

Mr. Baldwin said the Advisory Licensing Committee had investigated the quality of the British product and was satisfied that in this respect there was no sufficient reason for the grant of a licence. As regards price, the consumers concerned had been asked to furnish the Committee with certain information, on receipt of which the matter would be further considered.

Imports of Precision Balances

In reply to Mr. Kiley (House of Commons, May 8), Mr. Baldwin said that precision balances of the declared value of £2,987 were registered during the six months ending March 31 last, as imported into the United Kingdom, consigned from Germany.

Safeguarding Act Revenue

Mr. Baldwin (House of Commons, May 8) informed Captain Wedgwood Benn that the amount received up to May 4 in respect of duties under Part I. of the Safeguarding of Industries Act was £168,079. As no Orders had yet been made under Part II., no duties had consequently been collected under that Part.

Part II. Applications

Mr. Kiley (House of Commons, May 8) asked the President of the Board of Trade how many applications he had received under the Safeguarding of Industries Act, Part II.; whether he could say how many he had refused; and when the other applications would be dealt with.

Mr. Baldwin said that approximately one hundred trades or branches of trades had communicated with the Board, but the majority of these communications had not progressed beyond the stage of inquiry with a view to formulating complaints. Twenty-one complaints had been rejected or withdrawn. He was unable to say when the other applications would be dealt with, but no avoidable delay would take place after the requisite information had been received by the Board of Trade.

Duty on Drugs

Answering Captain Wedgwood Benn (House of Commons, May 8), Mr. Baldwin said a certain number of medicinal chemicals used in hospitals were subject to duty under the Safeguarding of Industries Act. He did not think that part of the poverty of the hospitals was caused by the duties imposed on drugs.

Scientific Instruments

Dr. Murray (House of Commons, May 8) asked the President of the Board of Trade why he had appointed a Committee to consider the imposing of an additional 33⅓ per cent. upon optical and scientific instruments imported from Germany, seeing that these articles were already subjected to a duty of 33⅓ per cent. under the key section of the Safeguarding of Industries Act.

Mr. Baldwin said the reason for the appointment of the Committee was that it appeared to the Board of Trade that a *primâ facie* case was made out that the conditions prescribed in Sec. 2 (1) (*b*) of the Act were fulfilled in regard to optical and scientific instruments.

Deliveries of Zinc Concentrates

Captain W. Benn (House of Commons, May 9), asked the President of the Board of Trade what was the quantity of concentrates and spelter received by the Government under the agreement with the Zinc Producers' Proprietary Association Ltd., Australia; what quantity had been sold; the total sum received from sales; and the profit or loss resulting from these transactions.

Sir W. Mitchell-Thomson said the quantity of concentrates and spelter delivered to date was 836,000 tons and 5,000 tons

respectively, of which 139,000 tons of concentrates and 3,000 tons of spelter had been sold. The receipts from sales amounted to £443,500. The zinc concentrates and spelter trading accounts as at March 31 1922, were in course of preparation, and the profit or loss could not at present be stated. It was anticipated that the accounts to that date would show a considerable loss.

Santonine Inquiry

Sir W. Mitchell-Thomson (House of Commons, May 9) informed Captain Wedgwood Benn that certain items of Government expenditure in connexion with the santonine inquiry had not yet been settled, but the total cost, including charges for shorthand notes, would be approximately £135.

Safety-Lamp Glasses

On the motion of the second reading of the Coal Mines (Temporary Provisions as to Safety Lamps) Bill, Mr. Bridgeman (House of Commons, May 9) explained that the object of the Bill was to give power to the Board of Trade to carry out a pledge given by the Home Office in 1914 to British lamp-glass makers. Nearly all the glass for safety lamps was made before the war in Germany and Austria. When the stock of lamp glasses began to run low in 1914, the Home Secretary, Mr. McKenna, who was then responsible for mines, felt he was bound to make some effort to get lamp glass produced in this country. The Home Office, with his written approval, gave an undertaking that German and Austrian safety-lamp glasses would be removed from the approved list until at least three years after the conclusion of the war. It was necessary for the English manufacturers to set up new and expensive plant, and the undertaking given to them was renewed by the Ministry of Munitions in 1917. There was now doubt as to whether the Board of Trade had greater power than to disapprove of a type of lamp glass, and the Bill was necessary to make good the pledge, which had still two years to run.

Sir D. Maclean considered that the fulfilment of the pledge concerned the whole House, and he suggested that the debate should be adjourned to afford Mr. Bridgeman an opportunity for consulting with the miners' representatives.

The motion for the adjournment was agreed to.

Contracts Open

TENDERS are invited for the supply of the following materials. The latest date for receiving tenders is (when available) given in parentheses :

EGYPT (June 15).—Drugs, &c., for Department of Public Health for six months from October 1 next. Particulars from Department of Overseas Trade (Room 53), 35, Old Queen Street, London (Ref. No. 7971/FE/SC.).

SWINDON (May 15).—Cement, lime, soap, acids, alkalis, colours, paints, lead, zinc, antimony, copper, asbestos fibre, varnishes. Particulars from Stores Superintendent, Great Western Railway, Swindon. Tenders to A. E. Bolter, Paddington Station, London.

LEITH (May 18).—Salt. Particulars from O.C., R.A.S.C., Lowlands Area, Leith Barracks.

WOODFORD (May 29).—Best quality furnace slag. Forms from and tenders to Mr. Farrington, Council Offices, Woodford Green, Essex.

INDIA (May 26).—Paints, dry and ground in oil, and driers. Forms from and tenders to Director-General, India Store Department, Belvedere Road, Lambeth, London.

WEALDSTONE (May 16).—Type "A" 24 in by 12 in. Jeffrey pulveriser. Particulars from H. Walker, Council Offices, Wealdstone. Tenders to R. J. Bryant, same address.

CAPE TOWN (July 14).—Portland cement (100,000 bags or 50,000 casks). Particulars from Department of Overseas Trade (Room 41), 35, Old Queen Street, London, (Reference No. 8554 ED./PN.)

PRETORIA (May 17).—Coal tar or tar substitute (60,000 galls). Particulars from and tenders to Beckett, Son, & Co., Suffolk House, 5, Laurence Pountney Hill, London.

Recent Wills

Sir John Kirk, F.R.S., D.Sc., of Wavertree, Sevenoaks, Kent, formerly of the Niger Co., Ltd.	£44,234
Mr. Edward Wilson, Woodthorpe, Esplanade, Greenock, drysalter and salt merchant	£22,507

Failure of a Consulting Chemist

UNDER a receiving order made against Leon Maurice Hirchberg, consulting chemist, 20, Birchington Road, Stroud Green, and Ely Place, London, on April 26, on a creditor's petition, the statutory first meeting of creditors was held on Tuesday at Bankruptcy Buildings, Carey Street, London, Mr. Vyvyan, assistant Official Receiver, presiding. It appeared that the debtor qualified as a chemist in 1900 and was afterwards employed as a chemist in Germany and in South America. He came to this country in 1912, and was then employed to supervise the erection of a chemical plant at Stratford. Under an agreement the owners of the works paid him a small lump sum and gave him a share in the future profits. The works were completed in the summer of 1913, when he severed his connexion with the undertaking. He then entered the employment of another company at £20 a month and a share of the profits, and remained with it until the outbreak of the war, when he was taken into the High Explosives Department, his income then amounting to £550 per annum. On January 9, 1919, he began as a consulting chemist at 85, London Wall, London. He was quite successful, and considered that he was making £1,000 per annum until October last, when depression took place in the chemical trade, and although there was afterwards a revival, the business eventually again fell off. In January he gave up his offices. He estimated his liabilities at £1,500, of which £600 was owing in respect of business debts. From January, 1919, until September, 1920, he was in partnership with another person, who provided £500 in return for a salary of £360 per annum and 25 per cent. of the profits. The business was continued in the debtor's name until September, 1920, when the partnership was dissolved by mutual consent. Accounts were prepared, but there was no profit after payment of the debtor's £1,000 a year. He agreed to repay his partner his £500 on retiring, and in respect of that undertaking had paid him £350. His late partner had, however, since brought an action against him for £125 and had obtained judgment. On or about March 10 last the debtor called a private meeting of his creditors, when he offered them the whole of his assets, to which his friends were to add such a sum as would make them up to £800, but the debtor stated that the petitioners were not satisfied, and instituted the proceedings in respect of which the receiving order was made. He attributed his failure to the illness of his wife and to the slump in chemical business. He valued his assets at, roughly, £700. The debtor, it was stated, had been hoping, with the assistance of friends, to make a proposal to his creditors, but this he found he was not in a position to do, and he would consent to an order of adjudication. Should he find it possible at some future date to make a proposal he would do so. A resolution was passed by the meeting for the appointment of Mr. P. S. Booth, accountant, Kimberley House, Holborn Viaduct, London, as trustee, to administer the estate in bankruptcy, and a committee of inspection was also appointed.

West African Palm Products

IN the House of Lords on Wednesday Lord Emmott urged upon the Government the importance of the immediate abolition of the differential duty on palm products in the dependencies of West Africa. The financial position of these colonies, he said, was alarming, and it was aggravated by heavy export and import duties, which might lead to permanent disaster. Earl Buxton hoped the Government would remove the differential duty at an early date. The Duke of Sutherland said the Government were not free to remove the duty without first consulting those engaged in the crushing industry, who had been led to believe that the duty would be maintained for five years after the war. For this purpose representatives of the trade would be asked to consult with the Colonial Office to ascertain if any way could be found of abolishing the duty without unfairly treating this industry.

Denman Baynes Studentship

AT Clare College, Cambridge, a Denman Baynes studentship, for research in mathematics or physics or chemistry, of the annual value of £100, will be awarded in July, tenure to begin on October 1 next. Additional information can be obtained from the Tutor, to whom application should be sent on or before July 12.

From Week to Week

The registered offices of LIGHTING TRADES, LTD., are now at Nobel House, Buckingham Gate, London.

MR. WILLIAM SMELLIE, of Meade-King, Robinson, & Co., has joined the board of the Maritime Insurance Co., Ltd.

The Director of the School of Tropical Medicine, Calcutta, invites applications for the post of PROFESSOR OF BIOCHEMISTRY.

After seventy years' service with Winsor & Newton, Ltd., MR. G. DAVIS has just retired. He began work with the firm when he was ten years old.

C. OXFORD & Co. announce that they have recommenced business as oil, fat and tallow merchants at India House, 84, Leadenhall Street, London.

The registered office of the RUBBER GROWERS' ASSOCIATION (INCORPORATED) is now at 2, 3, and 4, Idol Lane, London. The telephone number remains unchanged.

MR. WILLIAM GODDEN, F.I.C., lecturer in Agricultural Chemistry in the University of Leeds, has been appointed head of the Rowett Institute, Craibstone, Aberdeen.

A circular issued by the BRITISH CHEMICAL TRADE ASSOCIATION appeals to its members to see that the Safeguarding of Industries Act is "either amended or ended."

In the Chancery Division on Tuesday, Mr. Justice Astbury sanctioned a scheme of arrangement altering the rights of the preference and ordinary shareholders of HENRY BESSEMER & CO., LTD.

For stealing a TUBE OF QUICKSILVER (value £50) from the cargo of the steamship *Magdeburg*, Daniel Young, a boatswain, and William Heddle, seaman, have been sentenced to three months' imprisonment.

Reports are current that after inquiry in various States, BRUNNER, MOND, & CO., LTD., have decided not to establish works in Australia. Financial and industrial considerations are given as the reason.

SIR BERNARD MALLET has been appointed an additional member of the permanent panel from which committees are selected to consider complaints under Part II. of the Safeguarding of Industries Act.

At the annual meeting on Tuesday of the Nitrate Railways Co., the chairman, Sir Robert Harvey, characterised the crisis of 1921 as probably the most severe through which the NITRATE INDUSTRY had passed.

The guests at the ANNUAL GRADUATION DINNER of London University held on May 4, at the Guildhall, London, included Sir Richard Gregory, Sir Gregory Foster, Sir Sidney Lee, Sir Ernest Benn, Professor L. N. G. Filon, and Professor Winkler.

Professor H. E. Armstrong, Mr. A. Chaston Chapman, Sir Frank Heath, Professor A. R. Ling, Mr. R. B. Pilcher, and Dr. E. J. Russell, were guests of the INSTITUTE OF BREWING at the annual dinner of that body, held on May 5, at the Hotel Cecil, London.

It is reported that an OIL STRATUM has been discovered at d'Arcy, near Dalkeith, as a result of the operations started by Messrs. Pearson & Sons, five years ago. The stratum, which was reached at a depth of nearly 2,000 feet, promises a considerable yield.

A syndicate is reported to have formed in Glasgow for the purpose of exploiting NEW PAINT AND POLISH MEDIUMS, the invention of Mr. Charles N. Exley of the Plexter Chemical Co., Ltd., Glasgow, and Mr. Charles H. E. Ogilvie, a Glasgow artist and portrait painter.

It is reported that a syndicate has made an offer to the Munition Factories Disposals Board for the purchase of the whole of THE GRETNA FACTORY, and that the Board have refused this offer owing to a difference of opinion regarding the valuation of the property.

MR. F. W. JAMES the proprietor of the Cwmavon Chemical Works, Port Talbot, died at his residence, 3, Theodore Road, Port Talbot, on May 7. Mr. James, who was forty-nine years old, was the son of the late Mr. Lewis James, Cwmavon and leaves a widow, Dr. Henrietta James. He was a member of the Efan Lodge of Freemasons.

THE ACCOUNTS OF OXFORD UNIVERSITY for last year were presented in Convocation on Tuesday by A. J. Jenkinson, Fellow of Brasenose. As compared with 1913 the accounts showed an increase in income of £71,000, but this sum included a Government grant of £30,000, and £34,000 came from fees, dues, and other payments, a great part of which was exceptional.

Discussing trade prospects at the annual meeting of Pinchin Johnson & Co., Ltd., on Wednesday, MR. E. HOBSON said that the company's returns to date gave every indication that the extreme slump which has continued throughout the past year was now more or less at an end, and there were already indications that a moderate but steady improvement had set in.

Work has been completed at the ceramic experiment station of the Bureau of Mines, Columbus, Ohio, on BENTONITES, which are probably aggregates of alkaline hydrated silica and kaolinite. Some of their characteristics are conchoidal fracture, high colloidal content, high water of plasticity and drying shrinkages. Their burned colour varies from light buff to brown.

AN APPEAL has been issued on behalf of the Union Society of the University of London for a sum of £5,000, to erect a building, with club rooms, on the new University site in Bloomsbury. The Union, which was founded over a year ago, has already nearly 1,000 members. Donations may be sent to the honorary treasurer, Sir Sydney Russell-Wells, at 15, Gower Street, London.

The following DOCTORATES HAVE BEEN CONFERRED in the University of London: Ph.D. (Science) on Mr. A. C. Chibnall, for a thesis entitled "The Distribution of Nitrogen in the Leaves of the Runner Bean"; Mr. T. J. Drakeley, for a thesis entitled "The Ultimate Composition of British Coal," and Mr. H. S. Hatfield, for a thesis entitled "On a New Method for the Separation of Mechanical Mixtures of Powdered Substances."

THE SECRETARY FOR MINES has appointed Mr. Ben Turner to be a member of the Coal Advisory Committee as one of the representatives of workers in other industries, in place of Mr. J. W. Ogden, who has resigned, and Mr. D. F. Gill to succeed Mr. Myles Kennedy, who has resigned his appointment as one of the representatives of owners of iron ore mines and quarries on the Advisory Committee for the metalliferous mining industry.

The Commercial Secretary to H.M. Embassy at Peking is at present in this country, and will be in attendance at the Department of Overseas Trade, 35, Old Queen Street, London, early in June, for the purpose of interviewing firms who desire information or assistance in connexion with EXPORT TRADE TO CHINA. Applications for interviews should be made to the Department not later than May 30, and the reference number 8134 F.E. should be quoted.

A general meeting of the members of the ROYAL INSTITUTION was held on Monday, Sir James Reid, vice-president, in the chair. The deaths of Sir Alfred Kempe and Sir William Phipson Beale, late vice-presidents and managers, were announced and resolutions of condolence with the families were passed. Mr. J. P. Blessig, Dr. W. D. Halliburton, Dr. E. H. Hankin, Mrs. Percy MacQuoid, Mr. S. T. Nunn and Mrs. Theodore Stephenson were elected members.

At the Bow Street Police Court, on Wednesday, William Desmond Noble, of Wells Street, Cable Street, London, was summoned, as a director of NOBLE'S DRUG STORES, LTD., for failing to submit to the Official Receiver a statement of affairs within fourteen days of an order being made to wind up the company. The defendant pleaded illness and other causes. The magistrate imposed a fine of £10 and £5 costs and pointed out that this did not absolve the defendant from the duty of furnishing proper accounts.

The Board of Trade have referred to a COMMITTEE UNDER PART II. of the Safeguarding of Industries Act a complaint from the Incandescent Mantle Manufacturers' Association that mantles for incandescent lighting manufactured in Germany are being sold, or offered for sale, in the United Kingdom under conditions to which the Act was intended to apply. The Committee, of which Sir Bernard Mallet is the chairman, will hold their first sitting for the taking of evidence at 2.30 p.m. on May 31, at 5, Old Palace Yard, London.

At a meeting of the Royal Society of Edinburgh on Monday, Professor F. O. Bower, D.Sc., LL.D., the president, in the chair, Professor E. T. Whittaker read a paper on "THE QUANTUM MECHANISM IN THE ATOM." This was followed by a discussion on the quantum theory and atomic structure, in which Sir Alfred Ewing, Dr. H. S. Allen, Dr. R. A. Houston, and others took part. Other communications were "The Concomitants (including Differential Invariants) of Quadratic Differential Forms in Four Variables," by Professor A. R. Forsyth, and "The Asymptotic Expansion of the Confluent Hypergeometric Function, and a Fourier-Bessel Expansion," by Dr. T. M. MacRobert.

References to Current Literature

British

ELECTRO-CHEMISTRY. Notes on the electrolytic reduction of glucose. A. Findlay and V. H. Williams. *Trans. Faraday Soc.*, February, 1922, pp. 453-456.

The forms of electro-deposited iron and the effect of acid upon its structure. Part I. Deposits from the chloride bath. W. E. Hughes. *Trans. Faraday Soc.*, February, 1922, pp. 442-451.

The electrolytic recovery of zinc. S. Field. *Trans. Faraday Soc.*, February, 1922, pp. 400-431.

The problem of the fuel cell. E. K. Rideal and U. R. Evans. *Trans. Faraday Soc.*, February, 1922, pp. 466-482.

PHOTO-CHEMISTRY. The action of light on silver bromide. E. J. Hartung. *Chem. Soc. Trans.*, April, 1922, pp. 682-691.

TAUTOMERISM. Ring-chain tautomerism. Part I. The occurrence and effect of keto-enol tautomerism between a ring compound and its open-chain isomeride. G. A. R. Kon, A. Stevenson, and J. F. Thorpe. *Chem. Soc. Trans.*, April, 1922, pp. 650-665.

ORGANIC SULPHUR COMPOUNDS. Production and reactions of $\beta\beta^1$-dichlorodiethyl sulphide. F. G. Mann and W. J. Pope. *Chem. Soc. Trans.*, April, 1922, pp. 594-603.

COLLOIDS. The solubility of small particles and the stability of colloids. L. F. Knapp. *Trans. Faraday Soc.*, February, 1922, pp. 457-465.

A simple method of determining the coagulation of gold sols. E. Hatschek. *Trans. Faraday Soc.*, February, 1922, pp. 499-504.

POLYMERISATION. Polymerisation at the critical temperature. Part III. W. R. Fielding. *Chem. News*, April 21, 1922, pp. 213-214.

REACTIONS. The interaction of methyl iodide and potassium plumbite. J. G. F. Druce. *Chem. News*, April 21, 1922, pp. 215-217.

The influence of nitro-groups on the reactivity of substituents in the benzene nucleus. Part VI. The elimination of halogen during the reduction of halogenated nitro-compounds. H. Burton and J. Kenner. *Chem. Soc. Trans.*, April, 1922, pp. 675-682.

Introduction of the chloroethyl group into phenols, alcohols and amino-compounds. G. R. Clemo and W. H. Perkin, jun. *Chem. Soc. Trans.*, April, 1922, pp. 642-649.

TUNGSTEN. High temperature phenomena of tungsten filaments. C. J. Smithells. *Trans. Faraday Soc.*, February, 1922, pp. 485-494.

OILS. Insulating oils—colour and sludging characteristics. E. B. Wedmore. *J. Inst. Petroleum Tech.*, January, 1922, pp. 67-72.

Colloid chemistry of petroleum. A. E. Dunstan. *J. Inst. Petroleum Tech.*, January, 1922, pp. 73-79.

ANALYSIS. The estimation of aldehydes and ketones by means of hydroxylamine. A. H. Bennett and F. K. Donovan. *Analyst*, April, 1922, pp. 146-152.

The theobromine content of cacao-beans and cocoa. R. V. Wadsworth. *Analyst*, April, 1922, pp. 152-163.

United States

ORGANIC MERCURY COMPOUNDS. Organic nitro compounds containing mercury. G. W. Raiziss and A. Proskouriakoff. *J. Amer. Chem. Soc.*, April, 1922, pp. 787-793.

THIAZOLES. Researches on thiazoles. Part I. Derivatives of 2-phenyl-benzothiazole. Synthesis of an analogue of cinchophene. M. T. Bogert and E. M. Abrahamson. *J. Amer. Chem. Soc.*, April, 1922, pp. 826-837.

SILVER COMPOUNDS. Acetylene compounds with silver phosphate and silver arsenate. P. B. Oberdoerfer and J. A. Nieuwland. *J. Amer. Chem. Soc.*, April, 1922, pp. 837-840.

SUGARS. The clarification of solutions containing reducing sugars by basic lead acetate. The effect of different deleading agents. D. T. Englis and C. Y. Tsang. *J. Amer. Chem. Soc.*, April, 1922, pp. 865-867.

DYESTUFFS. Dyes containing the furane cycle. R. R. Renshaw and N. M. Taylor. *J. Amer. Chem. Soc.*, April, 1922, pp. 862-864.

METALLURGY. The metallurgy of tin. W. H. Jacobson. *Metal Ind. (N. York)*, March, 1922, pp. 103-105.

TANNINS. Gallotannin. M. Nierenstein. *J. Amer. Leather Chem. Assoc.*, April, 1922, pp. 155-157.

NITRE CAKE. Recrystallisation of nitre cake at 12°. B. Saxton. *J. Ind. Eng. Chem.*, April, 1922, pp. 281-285.

CELLULOSE. Contributions to chemistry of wood cellulose. Part I. Acetolysis of spruce pulp. L. E. Wise and W. C. Russell. *J. Ind. Eng. Chem.*, April, 1922, pp. 285-287.

INSECTICIDES. The physical properties of commercial arsenates of lead. R. H. Robinson. *J. Ind. Eng. Chem.*, April, 1922, pp. 313-317.

EXPLOSIVES. The U.S. Government explosives plant, Nitro, West Virginia. M. F. Chase. *J. Ind. Eng. Chem.*, April, 1922, pp. 260-268.

PETROLEUM. Thermal problems of petroleum refining. L. A. Mekler. *Chem. and Met. Eng.*, April 26, 1922, pp. 774-778.

FURFURAL. The system furfural-water. Part I. G. H. Mains. *Chem. and Met. Eng.*, April 26, 1922, pp. 779-784.

CERAMICS. New developments in the American glass industry. G. L. Montgomery. *Chem. and Met. Eng.*, April 26, 1922, pp. 788-793.

German

CATALYSIS. The catalytic reduction of aromatic nitro-compounds and a new method for the preparation of β-aryl-hydroxylamines. Part I. K. Brand and J. Steiner. *Ber.*, April 8, 1922, pp. 875-887.

The influence of Röntgen rays on the platinum catalysis of hydrogen peroxide. R. Schwarz and W. Friedrich. *Ber.*, April 8, 1922, pp. 1040-1051.

REACTIONS. The action of nitric acid on phenol ethers. K. H. Meyer and H. Gottlieb-Billroth. *Ber.*, April 8, 1922, pp. 823-826.

The Hofmann transformation of acid amides into amines. E. Beckmann and E. Correns. *Ber.*, April 8, 1922, pp. 848-856.

The transformation of methyl-aniline-chlorhydrate into toluidine-chlorhydrate (migration of the methyl residue in the benzene ring). E. Beckmann and E. Correns. *Ber.*, April 8, 1922, pp. 852-856.

The action of triethylamine on ketopinic acid chloride. E. Wedekind and C. Weinand. *Ber.*, April 8, 1922, pp. 945-951.

OXAZOLES. Some benzoxazole derivatives. S. Skraup and M. Moser. *Ber.*, April 8, 1922, pp. 1080-1101.

ENZYMES. Invertin. Part II. R. Willstätter and F. Rache. *Annalen*, March 30, 1922, pp. 111-141.

ACIDS. Free *o*-aminophenyl-acetic acid, its esters and conversion products. P. W. Neber. *Ber.*, April 8, 1922, pp. 826-848.

Sulphaminophthalic acid and sulphimidophthalic acid. T. Zincke and H. Greune. *Annalen*, March 30, 1922, pp. 221-255.

HYDRAZO COMPOUNDS. Further experimental contributions to the knowledge of the rearrangement of hydrazo compounds. P. Jacobson. *Annalen*, March 30, 1922, pp. 142-221.

PHOTO-CHEMISTRY. The behaviour of crotonic acid in ultraviolet light. Part II. R. Stoermer and E. Robert. *Ber.*, April 8, 1922, pp. 1030-1040.

HYDROXYLAMINE. A simple method of preparation of free hydroxylamine. H. Lecher and J. Hofmann. *Ber.*, April 8, 1922, pp. 912-919.

NUTRITION. Modern theory of nutrition. M. Rubner. *Ber.*, April 8, 1922, pp. 57-80 A.

STEREO-CHEMISTRY. The determination of the configuration of stereoisomeric hexamethylenes. A. Skita. *Annalen*, March 30, 1922, pp. 255-280.

THIAZINES. Linear (benzo-naphtho)-parathiazine. K. Fries and F. Kerkow. *Annalen*, March 30, 1922, pp. 281-302.

DYESTUFFS. A new class of vat dyestuffs containing nitrogen and sulphur. A. Reissert. *Ber.*, April 8, 1922, pp. 858-873.

ANALYSIS. Estimation of manganese by permanganate and investigation of different manganites. P. B. Sarkar and N. R. Dhar. *Z anorg. u. allg. Chem.*, April 13, 1922, pp. 135-155.

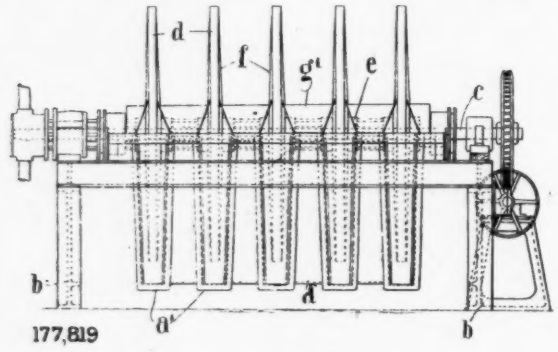
The electrometric determination of syanogen in the presence of halogens. E. Müller and H. Lauterbach. *Z. anorg. u. allg. Chem.*, April 13, 1922, pp. 178-192.

Patent Literature

Abstracts of Complete Specifications

177,819. Filtering Apparatus. E. W. W. Keene, 15-19, Coronation Road, Bristol. Application date, October 4, 1920.

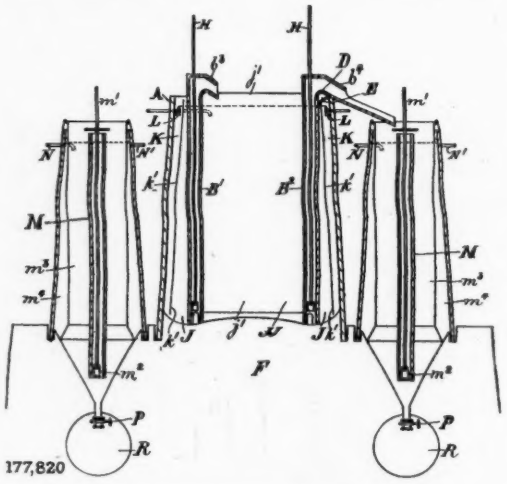
The appearance is of the kind in which a rotary member having a filtering surface is partly submerged in the liquid to be filtered while a vacuum is maintained within the member, and the solid material is removed from the surface continuously by means of a scraper. A horizontal shaft *c* carries a number of flat filtering elements, each of which comprises a disc or ring forming the outer periphery and two smaller central rings one on each side of the element. Filtering material or cloth *f* is secured between steel bands *d* around the periphery and bands *e* around the central rings. Radial clips may also be provided, so that each side face of the filtering element is of conical form. A radial scraper is provided on each side of each element so that a large filtering surface is provided relatively to the size of the tank. One half of the tank is constructed as a number of separate compartments a^1, one for each of the filtering elements, and a catch plate g^1 is arranged between successive compartments at the inner extremity of the scraper and parallel to the axis of the shaft. Any precipitate which may fall from the filtering element before reaching the scraper is thus directed away. The precipitate on the filter may be washed by means of a spray of water directed against each element as it emerges from the tank while the vacuum is maintained. The filtering elements may be cleaned by admitting air pressure or steam into the interior. Each filtering element may be divided into a series of equal or unequal sectors by radial partitions, and each



compartment thus formed communicates by passages with ports in a central rotary valve. This valve is connected with a number of pipes, so that any one sector may be subjected in succession to a process of filtering, washing, drying, or discharging the material during one revolution. The valve may be provided with an adjustable device for controlling the period of filtration and thus providing for differences in the character of materials treated, *e.g.*, those which cake rapidly and wash and dry slowly, or *vice versa*.

177,820. Extraction of Soluble Matter from Powdered or Crushed Material or Substances other than Tanstuffs, Method of, and Apparatus for. W. A. Fraymouth, 63, St. James's Street, London, S.W.1, J. A. Reavell, 28, Oakwood Avenue, Beckenham, Kent, and Kestner Evaporator Co., Ltd., 5, Grosvenor Gardens, London, S.W.1. Application date, October 5, 1920.

The apparatus is for extracting soluble constituents from powdered or crushed substances, and is applicable to the extraction of soluble salts from flue dust, the extraction of sugar from beet and other sugar-containing substances, and the extraction of soluble copper from oxidised ores. The apparatus is of the gas-lift-agitator type. A central agitator is provided with four "uplift" tubes B^1, B^2, preferably circular inside and square outside, and open at the bottom to admit the material into the tube. Each tube is provided with a pipe H for delivering compressed gas at the bottom of the tube. The upper ends of three of the uplift tubes are provided with outlets b^3 which direct the stream of liquor back into the centre of the tank, and the fourth tube is provided with an extended outlet b^4 which delivers into the centre of one of a number of smaller agitators surrounding the main agitator. All these outlets are detachable so that the outlet b^4 may be fitted to any of the "uplift" tubes, and any of the surrounding agitators may thus be supplied from the central one. An opening D is provided on the under side of the



outlet b^4 to discharge a part of the liquor over a shoot E. The four "uplift" tubes are mounted in a framing which is covered with impervious material to prevent fine particles from passing outwards. This screen is open at the top and bottom, and forms an annular chamber J. Another impervious screen k^1 is provided close to the walls of the tank forming an outer annular chamber K. The liquor in this outer zone is quiescent, so that a clear solution or extract is delivered over the knife-edged launder L. Each of the outer agitators is a circular vessel having a single "uplift" tube M at the centre provided with a gas supply pipe m^1. A single impervious screen m^2 is provided in each of these agitators, and the clear solution is discharged over a launder similar to L. The bottom of each agitator is connected to a discharge conduit R through a valve P. The water or extracting liquid circulates through the outer agitators in succession, so that the solution becomes gradually stronger. The powdered material is introduced into the tank A and circulated through three of the "uplift" tubes and discharged from the fourth. A strong solution is produced, some of which, containing fine particles, passes through the perforations D into the second annular zone J while the residue passes on through the outlet b^4. The suspended matter is deposited in the zone J, and the clear solution rises through the zone K to the outlet. The solution becomes gradually more concentrated as it passes through the outer agitators, from which the spent material is discharged in succession.

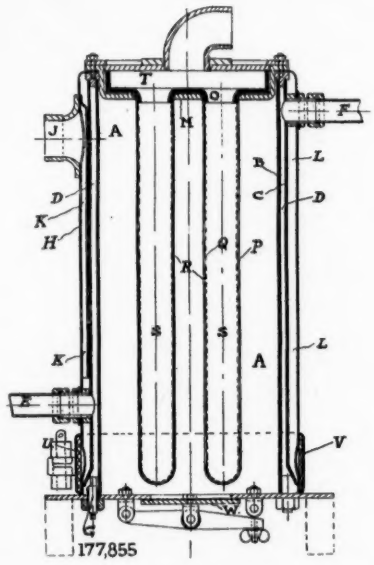
177,839. Concentration of Ores Containing Elemental Sulphur. T. R. Simpson, and Minerals Separation, Ltd., 62, London Wall, London, E.C.2. Application date, December 2, 1920.

In the froth flotation process for concentrating ores the ore is powdered and mixed with water to form a pulp which is agitated and then aerated. A frothing agent such as oil, fatty acid, or a product of the destructive distillation of coal, wood, &c., is added to facilitate the separation of the mineral constituent in the froth. A small quantity of a modifying agent such as mineral acid or alkali is also added to prevent the flotation of the gangue particles with the mineral. It has now been found to be possible to treat an ore containing elemental sulphur and siliceous gangue by froth flotation to recover the sulphur without the addition of any frothing agent or modifying agent. The treatment is carried out in a rectangular upright vessel containing a rotary horizontal impeller arranged at the bottom together with an air inlet at the bottom. The froth is formed and separated in a quiescent zone in the upper part of the apparatus. In an example a

Chilian sulphur ore containing 77.8 per cent. of sulphur and 20.6 per cent. of quartz was crushed to a 60-mesh standard screen, mixed with water, and subjected to froth flotation. The first froth consisted of 80 per cent. of the ore and contained 92.1 per cent. of sulphur. A second froth consisted of 6.8 per cent. of the ore and contained 55.3 per cent. of sulphur. The total amount of recovered sulphur amounted to 99.5 per cent.

177,855. Gas Cooling and Purifying Apparatus. J. W. B. Stokes, 56, Tennyson Drive, Parkhead, Glasgow, and C. J. Waldie, 60, Buchanan Street, Glasgow. Application date, December 31, 1920.

The apparatus is for cooling and purifying gas produced by the incomplete combustion of carbonaceous fuel in a suction or pressure producer. Two concentric metal cylinders B and C enclose an annular chamber D which is closed at both ends and provided with inlet pipes E, F, for the circulation of cooling water. An outer concentric casing H is provided with an inlet pipe J for the admission of the gas to be treated so that the gas passes downwards around the annulus of cooling water. Partitions are provided to direct the gas first downwards and then upwards through the chamber L and finally over the top of the annulus D into the inner chamber A. This chamber



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is closed at the top by a plate M from which a number of tubes P are suspended. These tubes are formed of wire netting covered with a filtering cloth and filled with an absorbent material, such as wood wool, sawdust, or sphagnum moss. The gas passes through the material to a chamber T and thence to the outlet. When gases obtained from bituminous fuel are treated, the tarry vapour is removed by means of a coating of similar tar on the filtering cloth. The whole of the purifying elements may be withdrawn for cleaning on removal of the cover of the apparatus, and outlets U, W, are provided at the bottom of the spaces L, A, for the removal of deposits. The apparatus provides a large purifying and cooling area in proportion to the size, and there is no effluent liquor to be disposed of.

177,946. Machinery for Crushing or Grinding Ore, Rock, Cement, or the Like. W. Graham, 131, Warwick Street, Belgravia, London, S.W.1, and D. Honeywood, 24, Herbert Road, Stockwell, London, S.W.9. Application date, February 21, 1921.

The apparatus is of the kind in which the material is crushed by means of stamps mounted on piston rods, the pistons of which are actuated by fluid pressure supplied by compressors or pumps, and in which the stamps are rotated during the crushing operation. The piston rod of the stamp is made hollow, the interior being square to accommodate the square rod of the operating piston. This rod projects upwards through the top of the cylinder, and carries a worm wheel, which engages with a worm to rotate it continuously. A special valve is provided in the upper end of the stamp cylinder to prevent the admission of air to the upper end of the stamp piston until a predetermined pressure is produced in the compressor.

178,046. Sulphate of Ammonia, Manufacture of. R. Lessing, Southampton House, 317, High Holborn, London, W.C.1. Application date, October 6, 1921.

In the usual process for the manufacture of sulphate of ammonia, the sulphate paste is run from the saturator on to a draining table. After as much liquor as possible has drained off, the crystals are further treated in a centrifugal apparatus to remove a further quantity of liquor. It has been found that crystallisation and caking take place on the draining table owing to cooling, thus producing hard lumps in the sulphate and contamination by impurities and acid from the mother liquor. In this invention, these disadvantages are avoided by completing the draining operation without any substantial cooling. The paste is run from the saturator into an acid resisting container placed in a steam-heated outer vessel. Alternatively, an ordinary steam-heated boiling pan of the tilting pattern fitted with a grid may be used, or the ordinary draining table may be fitted with a steam jacket or coils. This process may be combined with the decolorising process described in patent 152, 766 (*see* The Chemical Age, Vol. III., page 601). A sample treated in a steam-heated pan for one hour contained moisture 7.07 per cent, free acid 0.31 per cent. insoluble 0.02 per cent., and iron oxide 0.04 per cent.

Note.—Abstracts of the following specifications which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention:—155,246 (Moa Iron and Development Corporation) relating to treating ores, *see* Vol. IV., p. 230; 156, 121 (H. O. Traun's Forchungslaboratorium Ges.) relating to vinyl sulphuric acid and homologues, *see* Vol. IV., p. 314; 156,140 (H. O. Traun's Forschungslaboratorium Ges.) relating to lubricating oils, *see* Vol. IV., p. 341; 156, 170 (Koppers Co.) relating to ammonium sulphate, *see* Vol. IV., p. 342; 156, 245 (A. Wohl) relating to catalytic oxidation of hydrocarbons into carbonyl compounds, *see* Vol., IV., p. 342; 156,478 (Nitrogen Products Co.) relating to furnaces, *see* Vol. IV. p. 342; 157, 793 (A. Hartmann) relating to benzol hydrocarbons from coke oven gas, *see* Vol. IV., p. 455; 165,094 (K. L. E. Thunholm) relating to evaporating liquids to dryness, *see* Vol. V., p. 216; 165,438 (Soc. Chimique des Usines du Rhone) relating to saccharin, *see* Vol. V., p. 253; 170,575 (Siemens-Schuckertwerke Ges.) relating to purifying gases by electricity, *see* Vol. V., p. 775; 170,817 (A. Kampf) relating to recovery of carbon bisulphide, *see* Vol. V., p. 802.

International Specifications not yet Accepted

176,377. Lithopone. Cordes & Co. Ges. 124, Ritterstrasse, Berlin. International Convention date, March 4, 1921.

The process is for purifying the zinc salt solution, the baryta lye, and the water used to make light-proof lithopone. A small quantity of an iron or aluminium salt is added, and then a slight excess of a carbonate, phosphate, or hydrate. The liquid is then boiled and filtered. The baryta lye is purified in this manner and then treated with sulphuretted hydrogen to obtain barium sulphide.

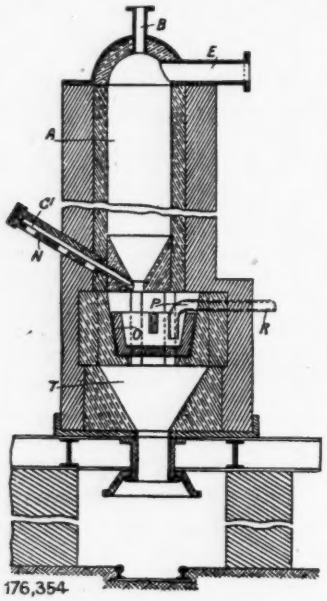
176,770. Aluminium and Potassium Chlorides. G. A. Blanc. 56, Via Fontanella di Borghese, Rome. International Convention date, March 7, 1921.

The process is for obtaining aluminium and potassium chlorides from leucite by a cyclic process. The leucite is dissolved in hydrochloric acid, and the hot saturated solution is cooled to crystallise out the potassium chloride which is filtered off. The liquor is then sprayed into gaseous hydrochloric acid, or the gas is passed through the liquor, and aluminium chloride is precipitated and filtered off. The remaining liquor containing hydrochloric acid is used again for dissolving a further quantity of leucite, and the process is repeated.

176,354. Calcium Hydride. A Kiesewalter, 8, Blücherstrasse, Frankfort-on-Main, Germany. International Convention date, March 3, 1921.

The process is for manufacturing calcium hydride. Three radial electrodes C′ are arranged at the base of a furnace chamber A, into which lime is supplied through the opening B. The electrodes are surrounded by jackets N, through

which hydrogen is supplied to react with the lime and produce a mixture of calcium hydride and calcium. The mixture flows into a vessel O, containing a transverse partition P. The hydride overflows on one side through vertical passages



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into a chamber T containing an atmosphere of hydrogen, and the calcium passes below the partition into the other compartment where it is converted into hydride by means of hydrogen supplied through a pipe R. The hydrogen which escapes from the outlet E is purified and used again.

176,779. Hydrogen, Carbon Monoxide, and Sulphur Compounds. Norsk Hydro Elektrisk Kvaelstofaktieselskab, 7, Solligaten, Christiania. International Convention date, March 9, 1921.

Gases containing sulphur are obtained from free sulphur, or by melting pyrites in an electric furnace when one half of the sulphur is liberated. The other half may be obtained by electrolysis. If the sulphur-containing gas is mixed with carbon dioxide and passed through an electric arc, a mixture of carbon monoxide, sulphur dioxide, and small quantities of other compounds is obtained. If the sulphur-containing gas is mixed with water vapour and similarly treated, a mixture of hydrogen, sulphur dioxide, and sulphuretted hydrogen is obtained. The sulphur compounds, carbon dioxide, and water may then be removed, leaving hydrogen or carbon monoxide.

Latest Notifications

178,797. Process for the production of synthetic Japan or Borneo camphor. Gawalowski, A. and Kutter, L. April 19, 1921.
178,801. Manufacture of articles of viscose. Kämpf, Dr. A. April 21, 1921.
178,809. Process for the production of solutions of volatile oils. Soc. Chimique des Usines du Rhone. April 20, 1921.
174,327. Manufacture of hydrogen by the partial liquefaction of gas mixtures containing the same. L'Air Liquid, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. Jan. 21, 1921.
179,150-1. Method of regenerating sulphurous acid and waste heat from sulphite cellulose boilers. Manufacture of fertilisers. Zellstoff fabrik Waldhof. April 27, 1921.
179,155. Process of ammonia synthesis and catalyst therefor. Scheuchzer, A. April 26, 1921.

Specifications Accepted, with Date of Application

155,824. Anhydrous Zinc Sulphide, Manufacture of. Fabriques de Produits Chimiques de Thann & de Mulhouse. December 16, 1919.
156,479. Atmospheric nitrogen, Process for fixing. Nitrogen Products Co. July 5, 1919.
156,694. Lignite tar and shale tar, Treatment of. E. Erdmann. September 2, 1919. Addition to 156,594.
157,808. Continuous distillation or gasification of organic matter or minerals containing organic matter, Process of and oven for. F. Rippl. August 25, 1915.
157,827. Coke ovens. American Coke & Chemical Co. June 22, 1916.
157,828. By-product condensers and methods of operating same. American Coke & Chemical Co. April 17, 1915.
157,976. Methane, Process for the recovery of. K. W. J. H. Jacobs. January 12, 1920.
159,175. Gas, Method of Producing. L. W. Bates. February 19, 1920.
159,142. Coke, Process of Producing. Trent Process Corporation. February 21, 1920.
174,327. Hydrogen, Manufacture of—by the partial liquefation of gas mixtures containing the same. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procedes G. Claude. January 21, 1921.
178,263. Salts from their solutions, Recovery of. T. G. Tulloch. February 22, 1921.
178,337. Rubber latex, Preparation of preservative substances for. F. G. Maguire, A. A. Agar, and H. T. Coulter. April 29, 1921.
178,475. Peat, Treatment of. J. Moeller and L. de Fonblanque. October 16, 1920.
178,485. Purifying and separating liquids, Process and Apparatus for. J. Claughton. November 15, 1920.
178,498. Alcohol fuels. S. W. Blake. December 16, 1920.
178,504. Rabbles for low temperature coal distillation purposes or other purposes where a like movement of the material is required. E. Barrs. December 20, 1920.
178,510. Coal Gas, Purification of. W. G. Adam. January 4, 1921. Addition to 127,431.
178,537. Medium and low temperature distillation of carbonaceous materials, Distilling or roasting plant and apparatus for. H. Nielsen. January 14, 1921.
178,560. Autoclaves and the like apparatus. E. Brown. January 19, 1921.
178,587. Magnetic Separators. H. H. Thompson and A. E. Davies. January 27, 1921.
178,636. Drying processes and apparatus therefor. N. Trestrup & Techno-Chemical Laboratories, Ltd. February 16, 1921.
178,779. Active charcoal, Manufacture of. W. Carpmael. (Chemische Fabrik auf Actien (vorm. E. Schering).) September 8, 1921.

Applications for Patents

Allgemeine Ges. für Chemische Industrie. Process for purifying hydrocarbons. 12,625. May 4. (Germany, February 21.)
Arends, R. Process for oxidising fatty oils, &c. 12,305. May 2.
Beilby, G. T. Carbonisation of coal, shale, peat, &c. 12,288. May 2.
British Dyestuffs Corporation, Ltd. Green, A. G. and Saunders, K. H. Method of dyeing artificial silk. 11,625. April 25.
British Dyestuffs Corporation, Baddiley, J. and Tatum, W. W. Dyes of the anthraquinone series. 11,983. April 28.
Burt, Boulton, and Haywood, Ltd. China, F. J. E., and Forbes, W. C. Manufacture of decolorising-carbon. 11,753, 11,754. April 26.
Cellulose et Papiers, Soc. de Récherchés et d'Applications. Extraction of oils or fats from vegetable matters. 12,045. April 29. (France, April 29, '21.)
Chemical Engineering Co (Manchester), Ltd. Treatment of and fats for neutralisation and removal of fatty-acid content. 12,772. May 5.
Damiens, A. A. L. J. Loisy, M. C. J. E. de, and Pietti, O. J. G. Process for recovery of ethylene in industrial gases for manufacture of alcohol or ether. 11,457. April 24. (France, June 2, 1921.)
Farbenfabriken vorm. F. Bayer & Co. Manufacture of sulphur dyestuffs. 12,629. May 4.
Krantz, F. and H. Process for refining organic matter used as manure. 12,228. May 1. (Germany, May 2, 1921.)
Meldrums, Ltd. Apparatus for effecting intimate contact of gases and liquids. 12,024. April 29.
Muntz, Sir G. A. Protection of copper and its alloys from oxidation or corrosion. 12,040. April 29.
Nitrogen Corporation. Synthesis of ammonia. 12,196. May 1. (United States, May 17, 1921.)
Pèdemonte, A. L. Manufacture of aluminium sulphate and pure alumina. 12,764. May 5.
Pettigrew, G. Saturator for continuous production of neutral sulphate of ammonia. 11,589. April 25.
Sharples Speciality Co. and Gill, H. A. Process for resolving water-in-oil emulsions. 11,584. April 25.
Spensley, J. W. Treatment of oils and fats for neutralisation and removal of fatty-acid content. 12,772. May 5.
Wilton, T. O. Continuous dehydration and distillation of tar, &c. 11,486. April 24.
Tallantyre, S. B., Galbraith, W. L., and Lewcock, W. Manufacture of condensation products from carbazole and p-nitro-sophenol and its derivatives. 12,311. May 2. Manufacture of condensation products from N-substituted carbazoles and p-nitrosophenol and its derivatives. 12,312. May 2.
Tully, C. B., Jaques, A., and West, J. H. Manufacture of hydrogen or gases rich in hydrogen. 12,529. May 3.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

LONDON, MAY 11, 1922.

THERE is no outstanding feature to report. Trade is on the whole better, and greater confidence is being shown by consumers. Prices remain relatively steady, while the undertone is very firm.

Continental competition is not so active. Export inquiry has been more in evidence and there is quite a discernible improvement in this direction.

General Chemicals

ACETONE is in fair request and the price is maintained.

ACID ACETIC.—Continental quotations are higher, and import small. The market is firm.

ACID FORMIC proceeds along quiet lines, but the price is maintained.

ACID LACTIC is very firm, and higher prices are asked for forward.

ACID OXALIC is unchanged, but business is of only moderate dimensions.

BARIUM CHLORIDE continues very scarce and firm.

CREAM OF TARTAR has been in better demand at last quoted figures.

COPPER SULPHATE.—Business has been done for near positions at full prices.

FORMALDEHYDE is inclined to be easy with only a small business to record.

IRON SULPHATE is in better request, and the price is slightly in buyer's favour.

LEAD ACETATE is firm, with small supplies available.

LEAD NITRATE is without change.

LITHOPONE is in quietly steady request, without change in value.

POTASSIUM CARBONATE remains a weak market.

POTASSIUM CAUSTIC is in very little request, and is in buyer's favour.

POTASSIUM PERMANGANATE is in slow demand, without change in value.

POTASSIUM PRUSSIATE is firmer, and supplies are very scarce.

SODIUM ACETATE continues firm and in good demand.

SODIUM BICHROMATE has been in only moderate request, but the price is maintained.

SODIUM BISULPHITE has been in better request, and the price is maintained.

SODIUM NITRITE is quietly steady.

SODIUM PHOSPHATE.—More interest is being taken in this product, but the price remains easy.

SODIUM PRUSSIATE is without change, and supplies are difficult to obtain.

WHITE LEAD is firm.

ZINC OXIDE has been in particularly good request at last quoted figures.

Coal Tar Intermediates

Business during the past week has been a little more interesting, and a fair inquiry is about, both on Home and on Export account.

ALPHA NAPHTHOL has been more interesting and is firm; export orders have been booked.

ALPHA NAPHTHYLAMINE is very firm, with a decent business passing.

ANILINE OIL AND SALT continue without change.

BENZIDINE BASE is steady, with some small inquiry about.

BETA NAPHTHOL is without any particular feature, though the usual business is passing.

DIMETHYLANILINE is steady, and moderate business has been done.

DINITROCHLORBENZOL is very firm, with stocks short.

DIPHENYLAMINE is without change; supplies are small and the price firm.

"H" ACID is steady, and the demand is good.

NAPHTHIONIC ACID is the turn easier.

NITROBENZOL is without special feature, but the usual orders have been booked.

NITRO NAPHTHALENE has been in better demand.

PARANITRANILINE is steady.

PARAPHENYLENEDIAMINE is firm, and orders have been booked.

"R" SALT.—Resale stocks seem to be cleared, and those remaining are of poor quality. Makers, therefore, are booking more business.

XYLIDINE has been interesting, and more business is passing in this product.

Coal Tar Products

The market generally remains fairly steady, and a certain activity is maintained in carbolics, cresylics and creosote, although benzols and naphthas are weak.

90's BENZOL is somewhat weak, and is not worth more than 2s. per gallon on rails.

PURE BENZOL is in poor demand, and the price remains in the region of 2s. 6d. per gallon on rails.

CREOSOTE OIL is somewhat scarce for prompt delivery, although up to now there has been no increase in value. This product is worth about 4¼d. per gallon on rails in the north, and 4¾d. on rails in the south.

CRESYLIC ACID is fairly steady at 2s. per gallon on rails for the pale quality 97/99%, while the dark quality 95/97% is worth about 1s. 9d. per gallon.

SOLVENT NAPHTHA is quiet, and is worth about 1s. 10d. on rails.

HEAVY NAPHTHA is also uninteresting, and is worth about 1s. 10d. per gallon at works.

NAPHTHALENE is in poor demand, the crude qualities being worth from £5 to £7 per ton, while the refined quality is worth about £15 to £16 per ton.

PITCH.—The market is quiet, and still somewhat irregular. Some further business has been done at 60s. and 61s. f.o.b. East Coast, although some manufacturers are still asking 65s. There is no change in the London position.

Sulphate of Ammonia

There is no change.

Current Prices

Chemicals

	Per	£	s.	d.		£	s.	d
Acetic anhydride	lb.	0	1	8	to	0	1	10
Acetone oil	ton	77	10	0	to	80	0	0
Acetone, pure	ton	75	10	0	to	77	10	0
Acid, Acetic, glacial, 99-100%	ton	59	0	0	to	60	0	0
Acetic, 80% pure	ton	43	0	0	to	44	0	0
Arsenic, liquid, 2000 s.g.	ton	67	0	0	to	70	0	0
Boric, cryst.	ton	60	0	0	to	65	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6	to	0	0	6¼
Citric	lb.	0	2	2	to	0	2	3
Formic, 80%	ton	68	0	0	to	70	0	0
Gallic, pure	lb.	0	3	3	to	0	3	6
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	40	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	45	0	0
Nitric, 80 Tw.	ton	30	0	0	to	31	0	0
Acid Oxalic	lb.	0	0	8½	to	0	0	9
Phosphoric, 1.5	ton	38	0	0	to	40	0	0
Pyrogallic, cryst.	lb.	0	6	3	to	0	6	6
Salicylic, Technical	lb.	0	0	10½	to	0	1	0
Salicylic, B.P.	lb.	0	1	3	to	0	1	5
Sulphuric, 92-93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb	0	1	3½	to	0	1	4
Alum, lump	ton	14	0	0	to	15	0	0
Alum, chrome	ton	30	10	0	to	32	0	0
Alumino ferric	ton	8	10	0	to	9	0	0
Aluminium, sulphate, 14-15%	ton	12	0	0	to	13	0	0

	Per	£	s.	d.		£	s.	d.
Aluminium, sulphate, 17-18%	ton	13	10	0	to	14	10	0
Ammonia, anhydrous	lb.	0	1	8	to	0	1	10
Ammonia, .880	ton	33	0	0	to	35	0	0
Ammonia, .920	ton	21	0	0	to	23	0	0
Ammonia, carbonate	lb.	0	0	5	to		—	
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate (Pure)	ton	35	0	0	to	40	0	0
Ammonia, phosphate	ton	80	0	0	to	85	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to		2	0
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered	ton	42	0	0	to	44	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, Chlorate	ton	60	0	0	to	68	0	0
Barium-Chloride	ton	17	0	0	to	18	0	0
Nitrate	ton	35	0	0	to	37	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	1	0	to		1	3
Bleaching powder, 35-37%	ton	13	0	0	to	13	10	0
Borax crystals	ton	29	0	0	to	33	0	0
Calcium acetate, Brown	ton	9	0	0	to	9	10	0
„ „ Grey	ton	13	0	0	to	13	19	0
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	6	10	0	to	7	0	0
Carbon bisulphide	ton	50	0	0	to	52	0	0
Casein, technical	ton	50	0	0	to	65	0	0
Cerium oxalate	lb.	0	3	6	to	0	3	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	2	to	0	1	3
Sulphate	ton	28	10	0	to	29	0	0
Cream Tartar, 98-100%	ton	110	0	0	to	112	10	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol	ton	72	10	0	to	73	0	0
Formusol (Rongalite)	lb.	0	2	6	to	0	2	9
Glauber salts, commercial	ton	5	10	0	to	6	0	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols	gal.	0	2	5	to	0	2	6
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	42	0	0	to	43	0	0
Carbonate (White Lead)	ton	42	0	0	to	46	0	0
Nitrate	ton	46	10	0	to	48	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	24	0	0	to	25	0	0
Magnesium chloride	ton	10	0	0	to	10	10	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	8	0	0	to	8	10	0
Sulphate (Druggists')	ton	13	10	0	to	14	10	0
Manganese, Borate	ton	65	0	0	to	70	0	0
Sulphate	ton	60	0	0	to	62	0	0
Methyl acetone	ton	60	0	0	to	65	0	0
Alcohol, 1% acetone	ton	65	10	0	to	66	0	0
Nickel sulphate, single salt	ton	49	0	0	to	51	0	0
Ammonium sulphate, double salt	ton	51	0	0	to	52	0	0
Potash, Caustic	ton	33	0	0	to	34	0	0
Potassium bichromate	lb.	0	0	6½	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride 80%	ton	12	0	0	to	12	10	0
Chlorate	lb.	0	0	4½	to	0	0	5
Meta bisulphite, 50-52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	0	9	to	0	0	10
Prussiate, red	lb.	0	4	6	to	0	4	9
Prussiate, yellow	lb.	0	1	2½	to	0	1	3
Sulphate, 90%	ton	15	0	0	to	15	10	0
Salammoniac, firsts	cwt.	3	5	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	23	0	0	to	24	0	0
Arseniate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	5½	to		—	
Bisulphite, 60-62%	ton	23	0	0	to	24	0	0
Chlorate	lb.	0	0	3¾	to	0	0	4
Caustic, 70%	ton	22	10	0	to	23	0	0
Caustic, 76%	ton	25	0	0	to	25	10	0
Hydrosulphite, powder, 85%	lb.	0	1	9	to	0	2	0
Hyposulphite, commercial	ton	13	10	0	to	14	0	0
Nitrite, 96-98%	ton	31	0	0	to	32	0	0
Phosphate, crystal	ton	18	10	0	to	19	0	0
Perborate	lb.	0	11	0	to	0	1	0
Prussiate	lb.	0	0	9½	to	0	0	10
Sulphide, crystals	ton	13	0	0	to	14	0	0
Sulphide, solid, 60-62%	ton	21	10	0	to	23	10	0
Sulphite, cryst	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	55	0	0	to	60	0	0
Strontium Nitrate	ton	58	0	0	to	60	10	0
Strontium Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	6	to	0	1	7
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride 102 Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	36	0	0	to	38	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	18	10	0	to	19	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	3	0	to	0	3	3
Alphanaphthylamine	lb.	0	2	0	to	0	2	1
Aniline oil, drums extra	lb.	0	1	0	to	0	1	1
Aniline salts	lb.	0	1	1	to	0	1	2
Anthracene, 40-50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	9	to	0	4	3
Benzidine, base	lb.	0	5	9	to	0	6	0
Benzidine, sulphate	lb.	0	5	9	to	0	6	0
Benzoic acid	lb.	0	1	7½	to	0	1	9
Benzoate of soda	lb.	0	1	6	to	0	1	7
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	4	9	to	0	5	0
Betanaphthol	lb.	0	1	6	to	0	1	9
Betanaphthylamine, technical	lb.	0	6	0	to	0	7	0
Croceine Acid, 100% basis	lb.	0	3	6	to	0	3	9
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	2	9	to	0	3	0
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthaline	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	5	to	0	1	6
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	2	6	to	0	2	9
Diphenylamine	lb.	0	4	3	to	0	4	6
H-Acid	lb.	0	6	6	to	0	7	0
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	0	to	0	6	6½
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	3	0	to	0	3	3
Naphthionate of Soda	lb.	0	3	0	to	0	3	3
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	0	10	0	to	0	10	5
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	6	to	0	1	9
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	10	0	to	0	10	6
Para-amidophenol, hydrochlor	lb.	0	10	6	to	0	11	0

Alsatian Potash

THE Alsace-Lorraine Trading Co. report: The inclement weather conditions which have prevailed during the past few weeks have had the effect of extending the fertiliser trade generally in districts where additional all-round manuring is required to give crops extra stamina. From sales effected in the root-growing districts it is apparent that larger dressings of Kainit 14% and Sylvinite 20% have been used, as compared with the spring planting season last year. Muriate of Potash and Sulphate of Potash and the high-grade Sylvinites are still in fair demand in the later districts. Quotations remain unchanged from last week on the following basis f.o.r. in bags London:

	s.	d.	
French Kainit 14% (K_2O)	3	8	per unit.
Sylvinite 20% (K_2O)	3	7	„ „
Sylvinite 30% (K_2O)	3	8	„ „
Muriate of Potash 50% (K_2O)	4	2	„ „
Sulphate of Potash 90% purity	6	0	„ „

The total output of crude potash salts from the French and the German Mines during the past two years was as follows:

	French Mines in Alsace.	*German Mines.*
1920 ..	1,061,197 metric tons.	11,386,439 metric tons.
1921 ..	902,100 „ „	9,241,179 „ „
Decrease	159,097 „ „	2,145,260 „ „

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

GLASGOW, MAY 10, 1922.

THERE is nothing of importance to record this week. Inquiries, especially for export, have been more numerous, but the actual amount of business put through shows only very slight improvement.

Continental quotations are high compared with prices ruling a few weeks ago.

Industrial Chemicals

ACETONE.—This market continues very inactive, buyers apparently holding off for reduction in price.

ACID ACETIC.—Glacial inclined to be firmer at £59 to £60 per ton, 80%. Technical £43 to £44, B.P., pure, £45 to £46. Mono Chlor offered from America at 10d. per lb. c.i.f. Liverpool.

ACID BORACIC.—Crystal or granulated £60 per ton. Powdered, £62 per ton, minimum ton lots.

ACID CITRIC.—In little request. Quoted at 2s. 1d. to 2s. 2d. per lb.

ACID FORMIC 85%.—Slight business done. Price £65 to £67 per ton.

ACID HYDROCHLORIC.—Price 6s. 6d. per carboy ex works. In little demand.

ACID NITRIC 80°.—Usual local demand. About 37s. 6d. per cwt. ex works.

ACID OXALIC.—Fair inquiry. Price steady at 8½d.

ACID SULPHURIC.—144° Tw., £4 per ton; 168° Tw., £7 5s. ex works. Dearsenicated quality £1 per ton more.

ALUM, LUMP POTASH.—A few inquiries but little actual business, £16 per ton ex station. Cheaper Continental offers.

ALUMINA SULPHATE.—17/18%, £15 per ton ex station.

AMMONIA, MURIATE.—In slightly better demand. Price £34 per ton c.i.f. U.K.

AMMONIA SALAMMONIAC CRYSTALS.—No change in price. About £57 to £58 per ton.

AMMONIA SULPHATE.—25¼%, £15 10s. per ton; 25¾% Neutral, £16 13s. per ton. May delivery. Supplies still small.

ARSENIC, WHITE POWDERED.—One or two inquiries for small lots. Price remains about £39 10s. to £40 per ton ex quay.

BARIUM, CHLORIDE, 98/99%.—Fair inquiry for export. Quoted £18 per ton f.o.b.

BARYTES.—Remains unchanged £4 per ton for Grey, £6 per ton for Finest White.

BLEACHING POWDER.—Still in poor request. Spot lots £14 per ton ex station. Cheaper Continental offers.

BORAX.—Usual small local demand. Crystals £29 per ton. Powdered £30 per ton ex station.

CALCIUM CARBIDE.—Price unchanged, £20 per ton ex store.

CALCIUM CHLORIDE.—English make £6 10s. per ton ex quay. Continental quotations slightly cheaper.

COPPERAS, GREEN.—Fair inquiry, about £4 per ton f.o.r. in wagon loads.

FORMALDEHYDE, 40%.—Offered at £70 10s. per ton ex wharf, Liverpool, barrels included.

GLAUBER SALTS.—In fair demand. Remains unchanged at £5 10s. to £6 per ton.

LEAD, RED.—£36 10s. per ton. LEAD, WHITE, £51 per ton. Slightly better demand for Red Lead.

MAGNESITE GROUND CALCINED.—Practically no demand. Spot lots, £11 to £12 ex store.

MAGNESIUM CHLORIDE.—Spot lots available at £8 per ton ex store. Fair inquiry.

MAGNESIUM SULPHATE (EPSOM SALTS).—Commercial quality, £7 10s. B.P., £9 15s. per ton f.o.r.

NAPHTHALENE.—In little demand. Quoted £16 per ton ex works for flakes. Crystals, £17.

NITRE CAKE.—Fair inquiry, 20s. per ton ex makers' works.

POTASSIUM BICHROMATE.—No change in makers' price, 6¾d. per lb. Cheaper lots of American make on offer.

POTASSIUM CARBONATE, 88/92%.—Continental offers of £29 per ton c.i.f. U.K.

POTASSIUM CAUSTIC, 88/92%.—Spot lots at £33 to £34 per ton ex store. Continental offers of about £31 10s. c.i.f.

POTASSIUM CHLORATE.—Quoted 4½d. to 5d. per lb. A few inquiries.

POTASSIUM NITRATE (SALTPETRE).—Fair inquiry for export. Price £36 per ton.

POTASSIUM SULPHATE, 90%.—Quoted £14 10s. per ton c.i.f.

SODIUM BICARBONATE.—Refined quality, £11 per ton ex station. M.W. quality, £10 per ton.

SODIUM BICHROMATE.—Remains unchanged at 5¼d. per lb. delivered. In moderate request.

SODIUM CARBONATE (ALKALI 58%).—£9 12s. 6d. per ton ex station. Soda Crystals, £6 per ton ex quay or station. Usual local demand.

SODIUM CAUSTIC.—76/77%, £25 10s.; 70/72%, £23 10s.; 60%, £26 5s.; 98/99%, Powdered, £29 to £30 ex station. In little demand for home consumpt. A few inquiries for export.

SODIUM HYPOSULPHITE.—Commercial quality, £13 10s. to £14 10s. ex store. Pea Crystals, £21 per ton ex store. Fair inquiry.

SODIUM NITRATE.—£14 15s. per ton. Refined quality, £15 per ton f.o.r. or f.o.b.

SODIUM SILICATE 140°.—No change in price, £10 to £11 per ton ex station.

SODIUM SULPHATE (Saltcake 95%).—In good demand for export, but supplies limited. Still being quoted at £4 per ton f.o.b.

SODIUM SULPHIDE 60/62%. Unchanged at £20 to £21 per ton, ex station. Broken £2 per ton more.

SULPHUR.—Flowers £14; Ground, £13; Rock, £12; Roll, £13. In little request. Price nominal.

ZINC DUST 90/94%.—Quoted about £45 to £48 per ton c.i.f.

NOTE.—The foregoing prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ALCOHOL, METHYL.—Pure 99/99½%. Offering at £64 per ton, c.i.f. U. K. Port

ALPHA NAPHTHYLAMINE.—Some inquiries. Offered at 2s. 1d. per lb., carriage paid, casks included.

BETA NAPHTHOL.—Offered by makers at 1s. 3d. per lb., carriage paid, casks included.

DIMETHYLANILINE.—Export inquiries. Price quoted, 2s. 9¾d. f.o.b., drums included.

DINITRONAPHTHALENE.—Offered at £35 per ton, f.o.r. makers' works.

METAPHENYLENEDIAMINE.—Home inquiry. Price quoted, 6s. 6d. per lb., delivered, casks free.

MONO NITRO NAPHTHALENE.—Offered at £20 per ton, f.o.r. makers' works.

PARANITROTOLUOL, 50/51°C. S.P.—Offered at 3s. 3d. per lb. carriage paid.

PHTHALIC ANHYDRIDE.—Fair inquiries. Price quoted, 2s. 8d. per lb. carriage paid, casks included.

Gas from By-Product Coke Ovens

AT a meeting of the North of England Section of the Coke Oven Managers' Association, held at Durham on April 29, Mr. T. Nicholson, in the course of a paper on "Gas for Town Use: a Coke Oven Supply," referred to the increasing interest which had recently been taken in the supply of gas for lighting purposes from by-product coke ovens. As a result of tests made at the Straker and Love Coke Works at Willington, it was found that 1 gallon of 90 per cent. benzol would raise 24,100 cub. ft. of gas by 1 candle power.

Mr. Nicholson described the type of plant from which the supply of gas was taken. The coking plant comprised 120 Semet-Solvay waste heat ovens built in four groups of thirty each—sixty ovens forming a battery, each battery having a separate by-product recovery plant. The gas was collected in hydraulic mains, there being a separate serrated dip-pipe sealed in liquor from each oven. In that respect the apparatus was identical with that used in ordinary gas works practice. The average temperature of the gas leaving the hydraulic main was about 80°C. Between the ovens there were 18 in. dividing walls which were independent of the heating flues and those walls took all the weight of the superstructure, thus having, in effect, a construction similar in all respects to the arches of a gas retort bench. Each oven was fitted with cast iron door frames with a hinged door on the ramside and a lifting door on the discharge side.

German Chemical Trade Notes

FROM OUR OWN CORRESPONDENT.

Berlin, May 8, 1922.

MARKET conditions are generally unsettled owing to the uncertainty of the position arising from the Genoa Conference. Owing to the recent fluctuations in the value of the mark offerings from weak hands have disturbed the market without inducing buyers to larger purchases.

The dyestuffs industry was well occupied during April; but the home consumption of dyes shows a decline as compared with the previous months, as consumers, anticipating further increases in prices, have mostly covered their requirements for some months in advance. German dyestuffs are meeting with strong competition abroad. Sales to Scandinavia were maintained and increased business was done with the Austrian States. In Holland and Belgium sales have declined, not so much on account of foreign competition as of illegally exported German dyestuffs. Trade with Greece and Bulgaria is restricted by Customs Tariffs. American and Swiss competition is encountered in Japan.

According to the most recent reports the much discussed arrangement between the Compagnie Nationale des Matières Colorantes et des Produits Chemique and the Interessen Gemerinschaft provides *inter alia* that the former will receive German technical assistance, German chemists supervising manufacture in the French factories.

Substantial increases are noted in the dividends paid by the explosives group; the dividends which have been announced are as follow: The Dynamite A.G. (formerly Alfred Nobel & Co., of Hamburg), 20 per cent. (last year's dividend, 16 per cent.); the Koln-Rottweil A.G., Berlin, 20 per cent. (last year, 16 per cent.); the Rheinisch-Westfälische Strengstoff A.G., Cologne, 16 per cent. (12.8 per cent last year); the Siegener Dynamit Fabrik, Cologne, 16 per cent. (12.8 per cent. last year).

Industrial chemicals had a better market during March than in the past month, although the demand from abroad has continued along fairly active lines. In this connexion it is interesting to note that in certain quarters a substantial development of Russo-German trade is anticipated. During the past week formic acid and salt cake have met with a ready demand for home trade. Caustic soda has declined somewhat in price owing to increased shipments of foreign makes from abroad. The market for coal tar products is firmer.

The following quotations are given in marks per kilogram (d. = domestic price, e. = export price).

ACIDS.—Acetic, technical, 30%, 22 mk. d.; 50%, 29 mk. d.; pure, 50%, 34 mk. d.; 80%, 41.50 mk. d.; 50 mk. e.; glacial, 98/100%, 52 mk. d.; 50 mk. e.; tendency firm. Acetyl-Salicylic, 245/275 mk. d.; 310/325 mk. e. Benzoic, sublimed, 101 mk. d.; synthetic, 130 mk. d.; 150 mk. e. Boric, crystallised, 76 mk. d.; powdered and flakes, 77 mk. d. Camphoric, pure crystallised, 20.50 mk. d. Carbolic, crude, 15/20%, 15 mk. d.; 35/40%, 20 mk. d.; 50/60%, 26 mk. d.; pure, 39-41°, redistilled, 88.50 mk. d. Citric—scarce; stocks on spot have advanced the price to 325 mk. d.; 340 mk. e. Formic, 80%, 28/29 mk. d. Lactic, pure, 25° Bé, 118 mk. d. Muriatic, pure, 1,126-1,127, 8 mk. d.; crude, 20-22° Bé, 4.40 mk. d.; technical, arsenic-free, 6 mk. e. Nitric, pure, 19° Bé, 13.50 mk. d.; crude, 40°, 16 mk. d. Oxalic, crude crystallised, 32 mk. d.; 98/100%, 42 mk. d.; 70/73 mk. e. Pyroligneous, crude, 3.50 mk. d.; rectified, 4.25 mk. d. Sulphuric—trade prices are: technical, 7.75 mk. d.; crude, 4.50 mk. d.; pure, 11.50 mk. d.; the new producers' price for 60° Bé acid is fixed at 203.20 mk. per 100 kg., whereas the consumers' price is 228.20 mk. per 100 kg. Tannic, 360 mk. d. Tartaric, crystallised and powdered, 155 mk. d.; 195 mk. e.; meeting with interest from foreign buyers.

INDUSTRIAL CHEMICALS.—Alum, Chrome, 15%, 32/35 mk. d.; scarce for export at 39/42 mk.; Potash, crystal powder, 8.50 mk. d.; 11 mk. e. Potash, in lumps, 12 mk. d.; 16.50 mk. e. Alumina Sulphate, 14/15%, 6 mk. d.; 8 mk. e.; 17/18%, 10 mk. e. Ammonia Carbonate, powdered, 19 mk. d.; 29/30 mk. e.; in lumps, 30 mk. d.; 38 mk. e. Barium Chloride, 19.75 mk. d.; 20 mk. e. Barium Nitrate, powdered, 34/38 mk. d. Bleaching Powder, 110/115°, 13 mk. e. Borax, refined crystallised, 39.50/44 mk. d.; powdered, 42 mk. d. Calcium Carbonate, white precipitated, light, 13/17 mk. d.; according to quantity. Calcium Chloride, 70/75%, 7.25 mk. d.; 5.90 mk. e. Carbon Bisulphide, 29/30 mk. d. Carbon Tetrachloride, technical, 29/35 mk. d. Copperas, 5.15 mk. d.; 6 mk. e. Copper Sulphate, factory prices, crude, 39/44 mk. d.; pure, 55/56 mk. d.; trade prices are, 98/100%, 33 mk. d.; 38 mk. e. Formaldehyde, 30%, 50 mk. d.; 55 mk. e.; 40%, 55 mk. d.; 77/79 mk. e. Glauber's Salt, crystallised, 2.90/3 mk. d.; 4 mk. e. Glycerine, 28° Bé, 92 mk. d.; 100 mk. e. Hydrogen Peroxide, 10.50 mk. d. Magnesium Carbonate, 52 mk. d. Potash Carbonate, 96/98%, 26 mk. d.; 39 mk. e. Potash Caustic, 27 mk. d.; 38 mk. e.; liquor, 40° Bé, 9.50/11 mk. d.; 50° Bé, 11.50/13 mk. e. Potassium Chlorate, commercial, powdered, 33 mk. d.; 36 mk. e. Potassium Cyanide, 98/100%, 99 mk. d. Potash Saltpetre, 29 mk. d. Salt Cake, 4.50 mk. d.; 6.35 mk. e. Soda Ash, 96/98%, 14 mk. e. Sodium Bicarbonate, 8 mk. d.; 18.25 mk. e. Sodium Caustic, 125/128°, 31.50 mk. d.; 29 mk. e.; liquor, 38/40°, 12 mk. d. Sodium Silicate, 38/40%, filtered, 3.75 mk. d.; 4.75 mk. e. Sodium Sulphide, 30/32%, 11.50 mk. d.; 14.50 mk. e.; 60/62%, 22 mk. d.; 24.50 mk. e. Sodium Sulphite, crystallised, 15.50/17.50 mk. d. Sulphur, 13 mk. d.; in sticks, 14.50 mk. d. Talc, powdered, 11 mk. d.; white, powdered, 12 mk. d. Zinc Chloride, 22.50 mk. e. Zinc Sulphate, pure, 23 mk. d. Bone Glue, best quality, 62 mk. d. Dextrine, yellow, 37/41 mk. d. Lead, Red, 38 mk. d.; 41 mk. e. Lead, White, powdered, 41 mk. d.; 43 mk. e.; in oil, 41 mk. d.; 44 mk. e. Sugar of Lead, 42 mk. d.; 48 mk. e. Lithopone, red-seal, 18 mk. d.; 25/26 mk. e. Skin Glue, A1 quality, 75 mk. d. Zinc White, red-seal, 34 mk. d.; 47 mk. e; green-seal, 38 mk. d.; 54 mk. e. Potassium Bichromate, crystallised, 65 mk. d.; 78 mk. e. Potassium Prussiate, yellow, 145/152 mk. d. Sodium Hyposulphite, crystallised, 16.50 mk. d.; 18.50 mk. e. Benzaldehyde, 120 mk. d.; 160 mk. e. Naphthalene, pure, in flakes, 18.25 mk. d.; 19 mk. e.; in balls, 18.70 mk. d.; 19.50 mk. e.

The Nitrate Market

HENRY BATH & SON, LTD., in their monthly report on nitrate of soda, dated April 29, state that the April deliveries of nitrate in Europe were about 124,000 tons, against 96,000 tons in April, 1921, and although the volume of fresh sales to consumers during the month has been only moderate, this can quite reasonably be attributed to the extraordinary backwardness of the season. Certainly the delay is irksome at a time when the great desideratum is to dispose quickly of the pool's stock, but there are signs in the last couple of days of a change for the better. Pool sales in April were about 55,000 tons, without any material alteration in prices. Meanwhile a great part of the cheaper nitrate for resale in continental markets has been absorbed, and any strong revival of demand must concentrate itself largely on pool holdings. This development has been confirmed by several sales recently of parcels of nitrate for May arrival on the Continent at about 14s. 4½d. to 14s. 6d. per cwt. c.i.f. German newspapers recently reported that, owing to deficient supplies of coal, the output of synthetic nitrogen by the factories at Leuna has been reduced by the equivalent of about 600 tons nitrate of soda daily, say 200,000 tons per annum, but this may, of course, be only a passing disability.

Nitrate Facts and Figures

THE nineteenth annual issue of the booklet compiled by Mr. A. F. Brodie James on "Nitrate Facts and Figures, 1922" (London: F. C. Mathieson & Sons; 5s. net), makes its appearance at a time when much interest is being evinced in the nitrate group of securities. Apart from general trade conditions, the nitrate industry has had its own special misfortunes, "arising in some measure from a conflict of interests between a Government anxious to secure revenue and avoid labour unrest, an association of producers unable to produce according to its capacity owing to a congestion of stocks, the result of high prices, and a pool of importers in practical command, and a situation from which it could have derived little or no satisfaction." It is true that, owing to a shortage of synthetic nitrogen, a decline in the production of sulphate of ammonia and a universal desire to increase foodstuffs production, the demand for Chilean nitrate is improving, but, according to Mr. James, the radical objections to artificial market expedients remain. Meanwhile production has fallen to 1,500,000 quintals per month, with only 20 per cent. of the oficinas at work. The author is of the opinion, however, that there is a good prospect of the others reopening before the end of the year.

The statistical information supplied is particularly useful, and is presented in a clear and readily comparable form. It includes the names and addresses of the nitrate companies with the names of their directors and secretaries; a comparative table of average prices of nitrate for prompt shipment per quintal f.o.b. Chile over different periods in seven consecutive years; outputs at oficinas of British domiciled companies for the past four years; the highest and lowest share quotations and dividends paid by nitrate companies during the past six years, and a comparative analysis of the various companies' accounts, including the date of formation and estimated life of the deposits.

Company News

SANITAS CO., LTD.—A further dividend on the cumulative preference shares, making 9 per cent. for the year, is payable on June 1.

SHELL-UNION OIL CORPORATION.—It is reported from New York that an offering will shortly be made of $20,000,000 8 per cent. preferred stock.

NITRATE RAILWAYS CO.—A loss of £5,494 was sustained in the working of the company in 1921. Including £100,421, the net revenue account shows a credit balance of £153,809. The sum of £63,704 is carried forward.

J. & E. ATKINSON, LTD.—After providing for taxation, depreciation, &c., the accounts show a loss for the year of £51,798. There is a deficiency of £26,220, to meet which the board have transferred £40,000 from the reserve fund. A dividend on the ordinary shares at the rate of 5 per cent. per annum is recommended, absorbing £10,208, and leaving £3,572 to be carried forward.

OLYMPIC PORTLAND CEMENT CO.—The profit and loss account for 1921 shows a credit balance of £67,631, which is disposed of as follows: To reserve, £20,000; to sinking fund, £5,725; to depreciation, £5,701. A dividend is announced of 12 per cent., less tax, leaving to be carried forward £15,205. The annual meeting will be held at 7, Gracechurch Street, London, on May 17.

A. & F. PEARS, LTD.—Holders of the preferred shares were in August, 1920, offered by Lever Brothers the option to exchange on a basis of seven 7 per cent. preference and eight 8 per cent. preference shares of £1 each in Levers for each seven shares in Pears. Ninety per cent. of the holders have accepted this offer, and the remainder are, it is stated, now being approached with a view to effecting an exchange on the same terms.

BELL'S UNITED ASBESTOS CO., LTD.—The net profit for 1921 was £40,842, which, with £34,124 brought in, makes £74,966. Interim dividends absorbed £9,138, leaving an available balance of £65,828. The directors recommend a further dividend on the ordinary shares of 1s. 6d. per share, making 10 per cent. for the year; £8,000 is placed to depreciation reserve, leaving to be carried forward, £34,013.

PINCHIN, JOHNSON, & CO.—The net profit for 1921, after providing for depreciation and taxation, was £45,924, which with £10,588 brought in, makes £56,512. After paying the preference dividend, less tax, the directors recommend a further dividend of 2½ per cent. on the ordinary shares, making 7½ per cent. for the year, less tax. £1,500 is allocated to writing off the preliminary expenses of the new capital issue, and £16,512 is carried forward.

NEW TRANSVAAL CHEMICAL CO., LTD.—The accounts for the year ended June 30 last show an available balance of £78,441, including £7,874 brought foward (against £85,333 in the previous year, when £7,141 was brought forward). A sum of £10,057 has been transferred to depreciation account, and a dividend on the ordinary shares of 15 per cent. has been paid, while the sum carried forward is £6,254. The dividend for the previous year was 17½ per cent.

LEVER BROTHERS, LTD.—The company has been inviting applications of £4,000,000 5 per cent. first mortgage debenture stock (1931-1941) at 92½. This issue is a further part of £15,000,000 authorised, of which £4,000,000 has been issued, and the present issue ranks *pari passu* with the stock already issued. The first payment and interest of 30s. per £100 of stock will be made on October 1. The security comprises first mortgages on the principal freehold and leasehold lands and buildings of the company, together with the fixed plant, and a floating charge on the other property and assets.

ANGLO-CHILIAN NITRATE AND RAILWAY CO.—The report for 1921 states that the amount brought forward was £210,624, from which is deducted the estimated liability in respect of corporation profits tax for 1920, amounting to £30,401, leaving £180,223. After providing for income-tax, service of mortgage bonds and all other charges, and the transfer of £25,000 to renewals account, the profit from all sources amounts to £158,384, making available for distribution £338,607. As already announced, the directors have declared a further dividend of 2s. per share, free of tax, making 15 per cent., free of tax, on the whole of the share capital for the year. The sum of £203,607 is carried forward, subject to corporation profits tax for 1921.

DIAMOND MATCH CO.—For 1921 the gross revenue totalled $4,603,497, less taxes $309,345; repairs and renewals, $524,762; depreciation, $928,658; amortisation, $299,956; interest on borrowed money, $159,367; bond interest, $450,000; estimated Federal taxes, $260,000, leaving net earnings $1,671,409. Dividends paid absorbed $1,357,208, and $314,201 was transferred to surplus, making same $3,370,081. The report states that New England operations are being continued entirely for the benefit of Bryant & May, of Great Britain, which company is advancing money from time to time to assist in financing timber and lumber operations. The Bryant & May advances against export shipments stood at $815,838 as at December 31, 1920, and $920,059 as at December 31, 1921, but meanwhile inventory of lumber, excluding all standing timber, has advanced from $812,784 to $1,207,943, and at December 31, 1921, Bryant & May advances represented only 58 per cent. of company's New England investment.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. No.
India	Cheap paint	528
Antwerp	Chemicals and drugs	532
Hamburg	Drugs	538
Budapest	Chemicals	541
Madrid	Soap	547
Egypt	Drugs, &c.	—
Buenos Aires	Paints and varnishes	551

Tariff Changes

BRITISH INDIA.—The full text of a revised schedule of Customs duties and official valuations for duty purposes was published in the Board of Trade *Journal* of May 4 (p. 485).

CYPRUS.—Revised import duties are now applicable to gunpowder, petroleum, paraffin and salt.

ITALY.—Platinum scrap and quinine products of all kinds may be exported from Italy without the requirement of an export licence.

GERMANY.—Import duty on the following articles is re-imposed as from May 1: Bone grease, waste grease (wool grease, glue stock, wool scouring grease, fulling grease (natural or artificial degras), and oil dregs. Particulars of the rates are obtainable from the Tariff Section of the Department of Overseas Trade.

ROUMANIA.—The exportation of natural tartar, artificial tartar or crystals of tartar known as "vinaccia," dried wine lees, calcium tartrates, and any raw material of tartareous origin is now prohibited.

UNITED STATES OF AMERICA.—A reprint of the essential parts of the proposed Customs Tariff, as reported by the Senate Finance Committee to the United States Senate, was issued on Thursday as a special supplement to the Board of Trade *Journal*. The Bill as it has come from the Senate differs in many important respects from the House Bill as published in a supplement to the *Journal* of August 4 last.

A Proposed Amalgamation

MR. ALEXANDER SMITH (chairman of directors) presiding at the annual meeting of Bryant & May, Ltd., held at Fairfield Works, Bow, on Wednesday, stated that within the last few days the company had entered into a provisional arrangement for amalgamating with the firm of Messrs. Maguire, Paterson, and Palmer, Ltd. The arrangements between the respective boards of Bryant & May, Ltd., and Maguire, Paterson, & Palmer, Ltd., is subject to the sanction of the shareholders of the latter company, and the amalgamation of the two companies is only so far as their English interests are concerned, excluding the Irish business, namely, the Paterson branch of Maguire, Paterson, Ltd. A new company is being formed in Dublin to take over the Irish business.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

FOSTER, J. R., 626, Holderness Road, Hull, chemist, £18 1s. 2d. March 8.

McCLELLAND & CO., LTD., 65A, Cannon Street, chemical merchants, £25 6s. 7d. March 8.

STEER, A. G., 66, Upper Tooting Road, S.W. 17, oil and colour merchant, £17 8s. 5d. March 16.

STUCKEY, W. G. & CO., LTD., 17, Down Street, W., chemists, £22 15s. 10d. March 8.

WALTON, J. W., 61, West Ham Lane, Stratford, chemist, £29 13s. March 9.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

BRITANNIA FERTILISER CO., LTD., London, S.W.—Registered April 28, £700 debentures balance of £1,000; general charge. *Nil. December 31, 1921.

LEADLESS WHITE MANUFACTURING CO., LTD., London, E.C.—Registered April 29, £6,000 debentures part of amount already registered. *£6,000. January 14, 1922.

LONDON HYGIENIC CHEMICAL CO. (1922), LTD., London, E.C.—Registered April 21, £3,000 debentures; general charge.

RADIOR CO., LTD., London, W., manufacturers and dealers in toilet and medicinal preparations.—Registered April 27, £800 debentures; general charge.

Satisfactions

HEDLEY (THOMAS) & CO., LTD. (late THOMAS HEDLEY & CO. (1905), LTD.), Newcastle-on-Tyne, soapmakers.—Satisfaction registered April 27, £12,000, balance of amount registered October 10, 1913.

LIQUID AIR, LTD. (late LIQUID AIR & RESCUE SYNDICATE, LTD.), London, N.W.—Satisfaction registered May 2, £3,000, registered May 27, 1921.

London Gazette

Company Winding Up Voluntarily

POLYCHROME CO., LTD. T. B. Brown appointed liquidator. Meeting of creditors, 63, Deansgate Arcade, Manchester, Wednesday, May 17, at 11 a.m. Particulars of claims to the liquidator, by June 30.

Bankruptcy Information

DEARN, Joseph Henry, 62, Oak Road, West Bromwich, Stafford, candle maker. First meeting, May 16, 11 a.m., official receiver's office, Ruskin Chambers, 191, Corporation Street, Birmingham. Public examination, May 26, 11 a.m., Law Courts, Lombard Street West, West Bromwich.

SKEAT, Charles, 609, High Road, Tottenham, Middlesex, chemist and druggist. Receiving order, May 4. Debtor's petition.

STEVEN, George, carrying on business at 118, Chorlton Road, Old Trafford, under the style of G. STEVEN & CO., manufacturing chemist. First meeting, May 17, 3.30 p.m., official receiver's offices, Byrom Street, Manchester. Public examination, June 15, 10.30 a.m., Court House, Encombe Place, Salford.

Partnerships Dissolved

CLEGG, Jonathan, and WOOLFENDEN, Fred, soap and chemical manufacturers, at Mabel Mill, Smithy Bridge, near Rochdale, under the style of SOLVO CHEMICAL CO., by mutual consent as from May 5, 1922. Debts received and paid by F. Woolfenden, who will continue the business.

SMITH-NEAL, Frederick Victor, FLETCHER, Alfred Henry, and HAWLEY, Howard Frank, colour, dye and chemical brokers, 48, Full Street, Derby, under the style of F. V. SMITH-NEAL & CO., as from December 31, 1921, so far as concerns A. H. Fletcher, who retires from the firm. Debts received and paid by F. V. Smith-Neal and H. F. Hawley, who will continue the business.

New Companies Registered

BEDFORD CHEMICAL CO., LTD., St. Mary's Commercial Chambers, St. Mary's Street, Bedford. Manufacturers of and dealers in chemicals, disinfectants, paints, enamels, varnishes, &c. Nominal capital, £1,000 in £1 shares.

COAL AND OIL REDUCTION, LTD. Distillers, extractors, manufacturers and suppliers of solid, liquid, and gaseous substances or matter derived from coal or other carbonaceous or other substances, or from the derivatives thereof. Nominal capital, £30,000 in £1 shares. A subscriber: E. J. Burrows, 29, Lyndhurst Road, Highams Park, Chingford, Essex.

EDWARD SUMMER & CO., LTD. Importers and exporters of and dealers in oils, paints, varnishes, grease, cements, polishes, chemicals and chemical substances, &c. Nominal capital, £1,000 in £1 shares. A director: B. C. E. Brechersen, 118, Goldhurst Terrace, London.

LALO OIL PRODUCTS CO., LTD., 78A, Mosley Street, Manchester. Manufacturing chemists, &c. Nominal capital, £1,000 in £1 shares.

LEONARDS, MANUFACTURING CHEMISTS, LTD., 6, New Burlington Street, London. Manufacturers of and dealers in salts, acids, drugs, perfumes, toilet requisites, &c. Nominal capital, £3,000 in £1 shares (2,300 preference and 700 ordinary).

SEVREN CHEMICAL MANUFACTURING CO., LTD., Finsbury House, Blomfield Street, London. Chemical and drug manufacturers, perfumers, &c. Nominal capital, £1,000 in 5s. shares.

Alcohol as Motor Fuel

A PRACTICAL investigation of the behaviour of alcohol in internal combustion engines has been carried out by the Empire Motor Fuels Committee of the Imperial Motor Transport Council, and the results have now been published in an interim report. The principal conclusions of the investigating sub-committee, of which Dr. W. R. Ormandy is chairman, are as follow:

(1) Alcohol can be employed from the low compression employed on paraffin engines up to a far higher compressio than can be used on any petrol; (2) the thermal efficiency obtainable with alcohol is higher than with petrol or benzol; (3) under all conditions of throttle or mixture alcohol requires the spark more advanced than is the case with petrol or benzol and much more advanced with the weak mixtures; (4) there was no evidence at any piston speed attained in the engine that the rate of combustion of alcohol under the conditions obtaining was too slow to obtain the maximum effect; (5) detonation does not occur at compressions up to 8-1, and pre-ignition does not occur at 6-1, even when running for long periods at the highest possible power output of the engine; (6) there were no evidences whatever of corrosion in the engine; (7) the power output and efficiency are increased by low temperature of the circulating water; (8) supplying heat to the carburettor reduced the power output but slightly increased the thermal efficiency; (9) increase in the water contents up to 10 volumes per cent. is an advantage, particularly in very high compression engines. A new series of experiments is now in hand with a view to investigating the influence of ether on alcohol, and the influence of alcohol on petrol, benzol, paraffin, and the like. It is believed that this work will prove of considerable value to the motor industry, as it is probable that the first introduction of alcohol on any scale as a motor fuel will be in the form of an admixture of the same with other ingredients.